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EDITORIAL NOTES.

National Gas Exhibition and Congress.

THERE are some people who prefer to withhold their support from a scheme until it assumes something of a very definite character. If there are any such who are making this the reason for the abstention of the names of their gas undertakings from supporting the National Gas Exhibition, they cannot longer conscientiously stand out with, before them, the report that the Executive Committee presented to the General Committee last Thursday; for the document (which is reproduced in other columns) displays a corporeal form that refuses to be regarded as something still intangible. Piece by piece, the Executive Committee are bringing together the members that will give to the exhibition scheme a finish and completeness unprecedented; and we have yet to discover any flaw in the arrangements. The scheme has, in fact, developed in a really remarkable manner—especially on the educational side, by the formulating of conferences which will bring before all interested both old friends and new as the authors of papers on subjects of present-day importance. All the authors are of distinguished position and competence on the subjects with which they will deal. The list of authors and topics will be found in the report of the Executive Committee; and, looking at the names and the subjects, we rather fancy that gas men—gas men in all administrative and official positions in the gas industry—will be found visiting the exhibition more often on account of these conferences than would be necessary in connection with the exhibition if it were being conducted without these auxiliaries to the main interest and object. The papers, too, will attract the Public Press; and likewise, we hope, men connected with other professions, as well as numerous members of the public. For the last-named, too, there will be popular lectures, as well as cookery demonstrations and competitions. Under these circumstances, the title has been extended from the National Gas Exhibition to the "National Gas Congress and Exhibition;" and therein, in our opinion, the only mistake has been committed if the extended title is going to be made use of generally for public purposes. The exhibition is the supreme thing; and it should in the title, as it will do in fact, maintain its supremacy by the scheme being described as the "National Gas "Exhibition and Congress." The whole intention of the project is to attract the public; and the public in these times is not so partial to congresses and receiving information by the ear as it is to things that appeal to the eye. As the "congress" will be supplementary to the exhibition, it should have had secondary place in the title; and we hope that its primary position in the title will be promptly disestablished.

The report that is published elsewhere is the second one that the Executive Committee have presented to the General Committee; so that the two should really be read together to obtain a full view of the development of the exhibition and congress scheme. The praise that the President of the Institution of Gas Engineers (Mr. Edward Allen) and the President of the Exhibition (Sir Corbet Woodall) bestowed upon Mr. F. W. Goodenough, the Chairman of the Executive Committee, Mr. H. M. Thornton, the Vice-Chairman, and their colleagues, it must be conceded by all, is richly deserved; for work of this character is not done in such thorough manner without brilliant initiative as well as skilled organizing powers, and a large expenditure of time and personal energy. The exhibition is to be opened on Oct. 1 by, in civic state, the Lord Mayor of the City of London; and we shall then have the first public touch given to the national character of the industrial enterprise by his Lordship being supported by several of—it is hoped by all—the Lord Mayors and the Lord Provosts of the United Kingdom. Regarding the exhibition itself, as is now well known, the whole scheme is built up on demonstration—demonstration typically of all that is modern in gas application. As progress is never better exemplified to the stranger whose interest it is desired to sharpen, and whose knowledge it is desired to expand, than by comparison, the Executive Committee are obtaining loans of ancient lamps and heating devices; and they are anxious for those who are in possession of pioneer burners, stoves, fires, and anything with which gas use in the divers branches commenced, to place themselves in communication with the organizers with the view to lending the appliances for the purpose. A letter on the subject will be found in our "Correspondence" columns; and further reference to the matter will be seen in the report of the Executive Committee. Through the gas undertakings of the country, and in the possession of manufacturers of gas appliances, there must be many relics of the industry's past that will remind of, or display, how gas was primarily and crudely used. If a good collection is brought together, it would be a matter worth consideration as to whether many of the things could not subsequently be preserved in an industrial museum, either as presentations by, or else as loans from, the present owners. While mentioning exhibits, it may be noted that the Brentford Gas Company and the Gaslight and Coke Company have kindly offered to supply all the gas piping and materials free for the exhibition, charging only for the labour employed in the work of fitting-up.

A word as to publicity. The Committee have this matter well in hand. Posters, leaflets, cards, and stamps are already advanced in preparation; and we hope—it is generally hoped by the organizers—that the hoardings and gas show-room windows and offices in every gas-supply area in the kingdom will, through the agency of the local gas undertakings, display the posters, and that the other means of advertising the exhibition will be made use of to the fullest extent of local opportunities. Special arrangements are also being made for admission tickets to the exhibition. If the managements of gas undertakings do not find ways and means of getting representative people from their localities to this unique display, the fault will be entirely their own; and they will miss an opportunity that cannot possibly recur save at very wide intervals. This exhibition will be the biggest and most convincing thing the gas industry has ever attempted. Therefore our advice is, Advertise it well; and make the greatest possible use of it while it lasts.

One other matter, and not by any means the least important. Big schemes of this kind—schemes that will command notice—mean large expenditure. There is not only the setting of the exhibition to be made suitable for the purpose; there are the inner buildings to be constructed for the demonstrations. These have to be furnished and decorated to make them exemplify actual conditions. There is heavy incidental expense to be faced; there are attractions of several kinds to be provided to gain for the display both attendance and publicity. This all means money; and it is all money well spent—the profit coming, *viâ* public interest, in an expansion of knowledge, and subsequent adoption in domestic, shop, factory, or street practices. The new uses of gas have to be—they must be—cultivated to maintain the advance of the gas industry. There are fresh fields to be conquered, and new work for the industry to do, to the profit of itself and the community. We must spend. Up to the present, £22,391 have been subscribed to the fund. The Society of British Gas Industries heads the subscription list. The gas undertakings come second. It is the obvious duty of gas undertakings that have not subscribed to reverse this position. The development of the use—the proper use—of gas is the first object that it is the intention of the exhibition to serve; the gas appliances are the means by which this is to be accomplished. As the expansion in use takes place, so the means of producing the gas must be extended. All benefit; but the first consideration, the first necessity, is the development of the use of gas. From the exhibition, there should pass through the country a wave of new knowledge as to the uses and applications of gas; through it old heresies, to which the competitors of gas

cling with affection and a disingenuous profession of ignorance, should be once and for ever banished. The sum of £22,391 has been subscribed; £26,000 is the estimate for the scheme. A further £4000 would enable an amount of publicity to be given to the exhibition which would do infinite good. We therefore ask not only for the £3600 to complete the £26,000, but for the further £4000 that will place perfection upon this special effort. To the reader, Is your undertaking among the non-subscribing ones? If so, then leave nothing undone to change the position.

Increased Business Swallowed-up by Coal.

THERE will be more than usual curiosity, during the period of the publication of the accounts of gas companies for the past half year, to ascertain what has been the effect of the position of the coal and residuals markets upon the financial outcome; for experiences cannot be universally the same, in view of the variation of local conditions in respect of vitality and scope. The Gaslight and Coke Company's area is an aggregate of varied conditions the equal of which for wide contrasts will probably not be found in any other gas-supply area in the country. We feel a certain confidence in saying that the greater the variability of local circumstances, the more likely, through the greater diversity in the use of gas, is it that business will be both maintained and increased. In the case of the Gaslight Company, what are the salient features of the accounts for the past half year? We have again to congratulate the Company upon a magnificent extension of business, but to commiserate with them over an extraordinarily heavy coal bill, while also congratulating them, under the circumstances, upon coming out financially approximately the same as twelve months since. What, however, does this mean? Simply this: That all the large additional income represented by a big expansion in the gas business, all the increase from gas meter and stove rentals, all the increase from the larger business in residual products, and all the extra value derived from high-class manufacturing results, have been completely swallowed up in the abnormal and unjustified high cost of coal. That, briefly told, is the whole story; that is what the Governor (Sir Corbet Woodall) will have to tell the proprietors on Friday next. Although the Company are in practically the same financial position as twelve months ago, it is, in the circumstances, very disappointing. No one but the coal people are benefiting from the increase in the Company's business, and from all the additional work that it represents—the consumers do not obtain from the increase anything in the way of a reduction, the proprietors do not get anything from it, nor do the Company's staff and men. There is nothing in the result for the Company and their consumers but the *status quo*, excepting the fact, for which there must be thankfulness, that the vitality of the business and working have enabled the Company to meet, without a heavy draft on their resources, the onerous situation created by the controlling powers in the coal market. It is hoped the Company will continue to be able to do so; for we have entered on a year when the colliery owners—the sweaters of industry—have caused prices to be placed higher still.

Let us translate the position into definite figures. Coal cost £801,573, which was greater by £257,411—over a quarter of a million sterling!—than in the corresponding period of 1912. But part of this was due to an enlarged consumption by 157,448 tons of coal. On oil, £37,263 was spent—being a decrease of £19,810; the amount used being 2,970,598 gallons less than in the corresponding half year. On coke for carburetted water-gas manufacture £42,735 was spent, or £10,305 less. Therefore the increase in the cost of gas-making materials was £227,296. Residual products yielded an additional £133,065, gas £59,156 more, and gas meter and stove rentals an extra £18,350. These together make £210,571 increase in revenue; and this was all swallowed up by the extra amount paid for coal, and still £16,726 to the bad. As we say, this is very disappointing, inasmuch as all the enhancement of business does not on the half year put the Company or their consumers in any better case than previously. There is no further reduction in the price of gas; the dividend of £4 17s. 4d. is, of course, the same; and while there was £712,387 undivided balance brought into the half year, after making the usual provision for fixed charges and the various funds and paying the dividends, £710,551 remains to be carried forward. Therefore, as already said, the Company have just about maintained the financial *status quo*, having only to draw upon the undivided profits for £1836.

Looking at the figures in more detail, it is seen that the total manufacturing charges, £1,261,612, were £253,364 more than in the corresponding period of last year. Supplementing the increase in the cost of raw material were rather higher charges for wages and purification; and in the item of £234,316 spent on repairs and maintenance of works, there is an additional sum of £15,720. But beyond this group of figures, the expenditure side of the revenue account is almost barren of notable change in the constituent items. On distribution, £352,131 was spent, which was a reduction of £5232; and, running down the other items, it is noticed that the account has not to bear a charge of £16,000 odd for retiring allowances as was the case twelve months since. But there is an entry of £4274 as a contribution under the National Insurance Act. On the other side of the account—the price of gas not having changed—the income from private gas consumption was £1,634,013, or an increase of £60,680; but as public lighting and contracts produced £1524 less (£64,239), the total receipts for gas, £1,698,252, were £59,156 more. The increase in the sales of gas was excellent—being 3¼ per cent.; whereas in the first half of 1912, it was only at the rate of 1·94 per cent. The increase of 3¼ per cent. represents in volume no less than 431,933,000 cubic feet, which would satisfy the annual requirements of a large-sized town. In the total rental of meters, stoves, and fittings, £221,236, there is an increase of £18,350. An advance of £5642 in the rental of stoves points to the continuing substantial development of the heating business. Probably the increase of £133,065 (the total being £657,737) in the receipts for residual products will, in the circumstances of the coal account, come as the most agreeable surprise of all; for, when the figures are examined, they show that, though the increased sales of residuals have not kept pace with the augmented production owing to the additional quantity of coal carbonized, good prices have been obtained. For coke, £402,744 was received; being £94,609 more than in the first half of the year. But the Company made 94,921 tons more; and, while themselves using an additional 15,859 tons, they were only able to supplement the sale of the first half of last year by 18,140 tons. The result is that, while they commenced the half year with 26,400 tons in store, they end it with 93,730 tons in store, which is 64,586 tons more than twelve months ago. The receipts for breeze amounted to £31,389, or an increase of £5808. The sale of 96,718 tons is greater by 16,539 tons than in the first half of 1912; but the half year ended with about 4000 tons more in store. Tar and tar products yielded £94,592—an advance of £21,837. The market is good in this direction. With a make of 10,091,649 gallons—an increase of 1,535,126 gallons—the Company absorbed at their tar works about 2 million gallons more than in the corresponding period; and in the sale of 556,912 gallons there was an increased demand of 68,740 gallons. Therefore, although the half year commenced with 1,457,272 gallons in store, it closed with about 432,000 gallons less stock. Then ammoniacal liquor and sulphate of ammonia contributed £129,011 to the revenue, or £10,810 more. The outcome is this: The sum of the receipts is £2,583,036, or an increase of £210,877. The total of the expenditure is £1,934,849, or an increase of £238,978. The increase in expenditure is greater than the advance in revenue by £28,101; and this is the amount by which the balance transferred to the net revenue account (£648,186) is short of the sum placed to the credit of the account twelve months since.

Looking into the working statements, there are again the evidences of close supervision and good working. There is also the evidence of the compulsory abandonment of part of the carburetted water-gas production, owing to the price of oil, and probably also difficulties of freightage came into account. The quantity of coal carbonized was 1,039,102 tons, or an increase of 157,448 tons; while the quantity of oil used shrank from 8,475,280 gallons to 5,504,682 gallons—a reduced consumption of 2,970,598 gallons. The total quantity of gas made was 15,107,888,000 cubic feet; being the big advance of 541,431,000 cubic feet. Of the total, 2,409,754,000 cubic feet were carburetted water gas; this amount being 1,046,531,000 cubic feet less than in the first half of 1912. However, deducting the carburetted water gas from the total gas made, we have 12,698,134,000 cubic feet of coal gas, which represent a production of 12,220 cubic feet of gas per ton of coal carbonized, or an increase of 178 cubic feet compared with the previous half year, but less than the production per ton in the first half of 1912.

In that half year, 12,600 cubic feet per ton were made; but that was the half year of the great coal strike, when the Chief Engineer (Mr. T. Goulden), the station engineers, and their staffs were all busy getting the maximum gas yield per ton, irrespective of a too refined consideration for less essential commodities. Of the make of 12,220 cubic feet of coal gas last half year, about 11,000 cubic feet were actually paid for; the balance, of course, being made up of the quantity used on the works and unaccounted for.

Therefore, it is found that the gas business of the Company has been good and flourishing; and the manufacturing and gas sales returns have been excellent. The prices of residuals have been at a good level; but what with the compulsory descent of the make of carburetted water gas, and the increased quantity of coal carbonized, the demand for coke has not kept pace with the larger output and quantity for disposal. But the one really black cloud is coal.

The Growing Demand for Oil.

THE responsible heads of those industries that use liquid fuel, oil for driving purposes or for carburetting gas, and for other objects, will have had their attention sharply directed to the largely growing demand for the natural product by the recent utterances of the First Lord of the Admiralty on the Naval programme and the scheme for the use of oil fuel, and will have considered whether or not the latter will have any effect in assisting to maintain oil prices. Offhand, one would say that there can be no question that it will do so, though the prospect of the Navy being large consumers of oil has been before the country so long that the actual fact of the gradual materialization of the project has probably been largely taken into account in the formation of the present position. In fact, the current prices of oil are sufficient to cover not only the actualities of the position, but a good deal that is potential, if not yet positively tangible. As must, however, be generally felt, though pressing national questions cannot be postponed indefinitely to serve the existing industrial conditions, the First Lord's statement of the naval policy in this particular regard came at an inopportune time so far as other users of liquid fuel and oil for various purposes are concerned; for such a pronouncement is not at all calculated to promote an easier state of things in the oil market. The state is anything but gratifying to the gas industry. Those fortunate makers of carburetted water gas who some time since made long contracts, or were able to get in at prices below the market quotations of to-day, have much cause to congratulate themselves in view of the relative positions of the coal and coke markets. Coke in certain districts is lower in value—lower than is customary when coal prices rule so high; while oil is at a stiff price. These are conditions that are not compatible with economical working. Hence the number of carburetted water-gas plants that are standing idle, or are only partially working, at the present time. If there is any consolation in the position of seeing competitors in the same boat, it is to be found by gas men in the high costs with which manufacturers have been confronted who have adopted the new forms of oil-engine, and those electricity undertakings that have placed their trust in liquid fuel (with its fickle propensity in the matter of price) for generating purposes. But their difficulties do not in any way help the gas industry to ride without trouble above its own.

The part of the speech of the Right Hon. Winston Churchill on the subject of oil was optimistic and partially contradictory. He acknowledged in one place that the future of the oil market was so uncertain, the subject so specialized, and present prices so unfavourable (he might have included high freights and shortness of the supply of tank-steamers), that a balance has to be struck between the relative advantages and disadvantages of making forward contracts. Yet in another place, he asserted that there was plenty of oil in the world to go round. If there is plenty of oil visible—this is not the only country that is making considerably growing demands on the supply—and producers are taking active steps in providing for the transport of the necessary quantities for meeting the expanding demand, then the future of the oil market ought not to be so very uncertain, if demand and supply were the only elements in the situation. In his Society of Arts Cantor Lectures on "Liquid Fuel," Professor Vivian B. Lewes, from his investigation of the best sources of information available to him, was not filled by an assurance that the supply of oil was going to be of such a quantitative character that the low prices of the past would be experienced in the future. The only hope he had of lower prices was that there were yet in the world large undiscovered tracts of oil-yielding territory which would come to its aid. Peradventure, the Admiralty have access to sources of information that were not available to Professor Lewes. Consumers, both present and prospective, will hope that they have, and that the outlook will soon be of a more cheery nature than current signs justify them in anticipating, without some more substantial grounds for it are presented to view. Mr. Churchill also pointed to the oil yielding capacity of the Scottish shales, the oil-bearing deposits in the Kimmeridge clay, and the possibility of some further expansion in the production of coal oil and creosote oil. But the development of all these more or less costly sources of supply would not serve the needs of the country to any great extent.

We are not at all sure that there is any substantial evidence to support another prediction made by Mr. Churchill. In referring to the upward movements of oil prices and of freights, he stated that, to a large extent, the causes that have operated to raise prices and increase the stringency of the situation are natural and automatic; and he also spoke, but with somewhat less emphasis, of the existence of formidable schemes for controlling the oil market and for raising prices. There are some people who think that the "formidable schemes" possess a fine equality in the matter with the natural and automatic causes. However that may be, Mr. Churchill and his advisers entertain the view that, as a consequence of these things, the oil-yielding territory is going to be pegged-out among different consumers "all of "whom" are taking steps to protect themselves against artificial manipulations, for which the state of the market at the present time offers so profitable a field. We have not heard of any particular movement in this direction among the consuming industries—at all events, there has been no obvious concerted movement on the part of the gas industry. If there has been, it has been exceedingly well obscured. We do not therefore think that our particular industry can be included in Mr. Churchill's statement; but the industry should look into the question of what is the amount of foundation that exists for it. If there is any movement of the kind, then the gas industry ought not to be shut out of it. However, the Government are proposing to "peg-out" oil-producing territory for naval purposes, to build refineries, and provide extensive storage at home and abroad, and to find the necessary sea protection in times of both peace and war, between the sources of supply and this country. It is a big scheme; and a pity it is that this part of it was not brought nearer consummation before there was so great publicity given to it. Bad tactics were displayed here. Seeing that the best known oil-producing territories have already been "pegged-out" by those very people who have promoted the formidable market-controlling schemes, makes the Government position the more interesting, as well as that of those unnamed industries which are said to be scheming to take possession of oil-yielding territory on their own account, and for their own protection. Mr. Churchill's statement was of interest on account of some of the particulars of which it was composed, just as much as on account of the disclosure of the Government policy in respect of the future driving power for a considerable part of the vessels of the British Navy.

There is one thing that is satisfactory, and it is that to the extent that the economic use of liquid fuel is developed, in that measure it will relieve the home coal market. Immediately after Mr. Churchill's statement, one of the organs of labour—the "Daily Citizen"—pointed out that the coal miners would certainly have a say in this conversion of the Navy's fuel from the solid to the liquid variety. Coal miners first, national safety and expediency second. That is the order of things, according to the principles of the coal miners, as portrayed by one of their organs. If the miners' views have been correctly presented—it is quite in form with precedent—it is seen that they do not approve more of the Navy partly changing from coal to liquid fuel, than the coal merchants do of householders changing from coal to gaseous heating. It is difficult to please everybody; and there is little use in hoping to do so.

Motor Spirit from Gas-Works.

ALTHOUGH benzol has been proved, when of good quality and fairly free from sulphur, to be highly efficient for motor driving, there are symptoms that the motor car makers and users are beginning to tire of looking to the carbonization of coal for any substantial relief from the burdensome control

of those who fix the price of petrol, according to their own fancies, which are shaped by self-interest. As it is an immediate relief that is desired, and not something that can only develop in the dim and distant future, we think they are right, without considering any other reason for the shifting to fresh ground for exploration. Another sign that gas-works and other coal carbonization processes are receding from the view of motor car makers and users as sources for any really substantial amount of the requirement for motor spirit was seen at the Imperial Motor Transport Conference the other day, when a resolution was passed urging the development of alcohol as a motor fuel. This was the direction in which, in a joint paper, Sir Boverton Redwood and Professor Vivian B. Lewes counselled them to look with the greatest hope; for they unitedly have come to the conclusion that neither from gas-works nor from low-temperature carbonization processes will issue that for which the motor car makers and owners are looking.

The authors are of opinion the amount of motor spirit to be obtained from high-temperature gas-retorts would be but a drop in the ocean of demand; and while with low-temperature carbonization processes more might be obtained, the claims are of an exaggerated order. Professor Lewes asserts that he knows, and he certainly ought to know, something on this head, though the system with which he obtained experience—a system in which he declares he has seen "a "good many million" tons of coal distilled at low temperature—was probably not technically the best for this particular purpose, as it was not for other purposes. We will not contradict the "good-many-million-ton" statement—a few tons one way or the other do not matter much on the platform; but we never saw the market results of these millions, though we carefully watched for them. However, those present at the conference were largely guided by the views of Sir Boverton Redwood and Professor Lewes; and practically plumped for alcohol. This notwithstanding Mr. W. J. A. Butterfield's computations as to many millions of gallons of motor spirit being available by the stripping of coke-oven gas and of the product of the country's gas-works; and notwithstanding, too, the vivid picture that Dr. Rudolf Lessing drew of the shocking waste through the wherewithal to meet the requirements of motor car users passing away up the chimneys rising from the crudely working domestic grates.

Since the campaign commenced, we have never been convinced, in view of the competitive position, of the soundness, from the financial point of view, of the stripping proposition as applied to town gas. The scheme, too, means a technical revolution in the plans of the gas industry; and the idea of Dr. Lessing is really a revolution in a domestic practice. Such revolutions, in view of the ties of custom and conditions, are never swiftly accomplished. Such changes only come along with measured movement. They are big things; and the motor owners cannot wait upon the leisurely gait of the gas industry and of the domestic fire-place to give up something with which the one has no power to part (even if financially justified), and from which the other seems disinclined to part.

Hygienic and Heating Efficiencies.

There has been evidence, where gas engineers have gathered together during the week, of much interest having been aroused by Mr. W. J. A. Butterfield's investigation into this matter, seeing that the results go to show that it is possible to have with gas-fires complete hygienic efficiency without flue-pipes, and that, without affecting the radiant efficiency any reasonable length of flue-pipe may be used. It is recognized that this gives a latitude in the fitting of flue-pipes not obtainable with fires that require variable lengths of flue-pipe to overcome the emission of products of combustion beneath the canopy. This is a most important consideration, the value of which gas engineers appreciate. There have been two suggestions made during the week regarding Mr. Butterfield's tests. The first is that confirmatory radiation tests should be made by the Leeds method. Those who read with care the article published last week will have seen that such tests have already been arranged for. As relative tests, no one can dispute the accuracy of those presented in the article; and the investigator was scrupulously clear in explaining the conditions and his views respecting them. Among them he stated that he preferred to use a radiometer which he found had been employed for some time past in the laboratories of the Davis Gas-Stove Company to the one devised by Professor W. A. Bone and Dr. Drugman, which was, at their instance, adopted by the Gas-Heating Research Committee of the Institution of Gas Engineers. He was further inclined to take this view because the Bone-Drugman radiometer readings depend upon a reference to, or a comparison with, Professor R. H. Smith's radiometer, on which the one used in the Davis laboratories appears to be an improvement. Later on, Mr. Butterfield says he hopes to give a comparison between measurements of the radiation of gas-fires by a radiometer of this type and one of the thermopile type. At the present stage he will only say that it appears to him that the latter instrument is liable to give readings which are in excess of the truth. Therefore, the suggestion as to radiation tests under the Leeds method are already being provided for, and therefore this meets the first point. The second suggestion is one that also bears on the question of radiation. It is that it would be instructive to have radiation tests made, if possible, with the Davis fire fitted with Wright fuel, and *vice versâ*, on lines corresponding to those the results of which were published last week. The suggestion seems to indicate the view, on the part of the person making it, that the nature or composition of existing fuels may have something to do with small differences in relative radiant efficiency between different fires. If there is not interchangeability between the two fuels named, perhaps there are other fuels on the market with which tests could be made. We are not at all sure that the last word has been said in regard to the composition of gas-fire fuel or "radiants." But, after all, positive hygienic efficiency first; radiant efficiency second. Having got the former, then work to make under it the radiant efficiency as high as possible.

Satire in the Magazine.

A smart piece of burlesque, over which gas men can have a hearty laugh, and a few may profit from the mirroring in hyperbole of the business shortcomings of the exceptional rather than the normal gas office, appears in "Pearson's Magazine" for July, from the pen of "Inglis Allen," with pictorial emphasis by Mr. Reginald F. Smith. Though the majority of gas suppliers do not deserve it, a little twitting of the kind can do no harm; for, in this year of grace and sharp competition, one unhappily finds samples of men whom Inglis Allen extravagantly describes as "Gas Fiends," but who are the conservators of a past age of gas commercialism, with brains and movements clogged by the practices of distant times, or are the inflated products of an undiplomatic bureaucracy. The particular company with which the satirical critic deals is represented as one of the concerns with a bureaucratic system, with many officials in the sales department—all of irresponsible character, and exhibiting a supreme indifference to the requirements of, and yet unfailing personal courtesy to, possible customers. Though, too, making a great display of a highly "scientific" but ineffective system of printed contract, instructions, and record, there is also an imposing dilatoriness of execution that would be more in accord with the extreme of bucolic life than in harmony with the rush and press of the time's active struggles for business. Candidly, we do not recognize the company upon which Inglis Allen pours the vials of his sarcasm, as his description does not harmonize with any we know—not even with the sleepy-headed company which was discovered by us, through the complaint of a builder, some few months since. Departmentalism, with systematic control, is essential in large and fully-developed gas concerns; and there are those about us that have worked wonders under the new order of things. This has not been done by inattention and dilatoriness, accompanied by an "unimpaired cheerfulness," at all times when faced by the irate and neglected would-be customer.

All Over a Gas-Ring.

The story tells of a tenant entering into the occupation of a new flat; of a requirement for the fitting-up of a nursery gas-ring; of several visits to the gas office and conversations (sometimes in calm and sometimes in embroidered language) over the telephone; of frequent repetition of the nature of the requirement; of an ultimate delivery of a gas-cooker that was not wanted and that increased irritation; of the appearance of the man eventually to fix the meter, and of the damage he did; of the exhaustion of the patience of the householder; of the prompt, final, and deserved exit of the gas company and their servants from the flat; and of the instalment of a nursery oil-stove. It is a long-winded tale, full

of extravagances; and yet we are afraid, when we remember that there are still a few companies who keep the methods of other days still dominant, there is partial truth at the foundation. At the same time, there is another side to the Inglis Allen tale. Much was expected in connection with the fixing of a paltry nursery gas-ring. Evidently the flat was lighted electrically; and the gas company were expected to supply and fix a meter, open an account, provide a meter inspector and an account collector, and pass through exactly as much routine as would be necessary in connection with a substantial consumer, and all for the purpose of supplying gas to the consumer's own gas-ring, the only use to be made of which was warming-up baby's food. Some people look for much from a tradesman. Inglis Allen's "flat" occupier expected much for a very little from the gas company. In truth, business of such a nature is hardly worth having—costing, as it would do, the company as much in running expense as would have been the case had the flat been lighted and heated throughout with gas. It is often the smallest gas consumers of the "middle class" who are the most difficult to please, and who magnify trifles; and officers of gas companies who are alive to their business know that these can be the most mischievous of any in circulating a bad character.

An Experience from the Other Shop.

Defence by comparison with others is bad; but before us there is a set-off (concerning an electricity company) to Inglis Allen's story at the expense of a gas company. A contract had been entered into by a gas company for work, including the supply of a gas-engine, in connection with a certain factory. After the contract was signed, the electrical convasser called, with the result that certain terms were offered by him, which resulted in the firm, on their side, cancelling the contract with the gas company, and entering into one for the supply of an electric-motor. The new contract was signed. In due time, we believe the motor was delivered; but then, to their dismay, the firm were informed that the cable from which the supply for the motor could be obtained was a considerable distance from their establishment—probably 200 to 250 yards. This was awkward after the gas-engine contract had been cancelled; and the firm and the electricity suppliers are still wrangling over the question as to the payment for extending the cable. It is understood the requisite motive power for the purpose in view in this particular factory is still a desideratum. What would Inglis Allen have had to say to this condition of things if he had been a member of the firm, and not "Myra's" husband, a much exercised father, and the owner of a nursery gas-ring?

A Word with Coke-Oven Owners.

In dealing with the work of the Sulphate of Ammonia Committee last week, as well as, in another article, with the report of the Chief Inspector under the Alkali Act, references were made to the position of the coke-oven industry as sulphate of ammonia producers. The point as to the influence of bye-product coke-ovens upon the sulphate of ammonia market has since been further investigated; and the result is surprising. Since 1902, the British coke-oven output of sulphate of ammonia has mounted up from 15,352 tons to 104,932 tons—an increase of no less than 583 per cent. This is a remarkable stride for a decade; and it means a vast amount of work to develop the absorption of such an addition to supply. In the same period, the shale-oil sulphate of ammonia production has risen from 36,931 tons to 62,207 tons, which is equal to an increase of 69 per cent. On the other hand, the gas industry has only been responsible in the same period for an advance in production of 22,039 tons, or 14·7 per cent. Inquiries show that, though last year coke-ovens and ironworks produced together 121,958 tons of sulphate of ammonia, from these sources the Sulphate of Ammonia Committee only benefited by contributions representing 87,660 tons, or 72 per cent.; so that 28 per cent. of the coke-oven and ironworks tonnage, while participating in all the advantages accruing from the Committee's work, contribute nothing to their support. This is not as things should be. Practically the whole of the shale-oil tonnage subscribes. That is as things should be.

The Imperative Cause for Activity.

It is patent that it is chiefly due to the activities of the coke-oven proprietors that the work of the Sulphate of Ammonia Committee has become so vitally important to the whole sulphate of ammonia trade; and it is therefore only right that the Committee should be able to look to coke-ovens for a much larger measure of support than they are giving to the propaganda work at the present time. We hope the non-subscribing owners will consider the matter from this point of view: They have come into a market in which those who were already serving it were previously working for the further development of demand. The production that the coke-ovens have launched upon the market have increased the difficulties and labours of those who have helped to make the market what it is, and have distributed the benefit among the producers, subscribing and non-subscribing alike. Therefore the coke-oven owners should help to bear the cost of stimulating and broadening the market. If there is any logical reason that can be advanced against this submission, we shall be interested in hearing of it. Better intelligence will be that the 28 per cent. of unrepresented tonnage of the coke-ovens will in future take its share of the light burden per ton of sulphate of ammonia incurred in promoting the receptivity of the market for the growing production.

South Metropolitan Gas Company's Dividend.

We learn from the Secretary of the South Metropolitan Gas Company (Mr. F. M'Leod) that the profit on the working in the half year ended the 30th of June, after providing for the payment of debenture interest, will (subject to audit) enable the Directors to recommend the payment of the statutory dividend at the rate of £5 9s. 4d. per cent. per annum, carrying forward a surplus of £1206. Six months ago the dividend was at the same rate; but the amount carried forward this time last year was reduced by £31,727.

Important American Award for Dr. Bone.

We are pleased to learn that the Franklin Institute of Philadelphia has awarded the "Howard N. Potts Gold Medal" to Dr. W. A. Bone, F.R.S., for "an original and meritorious development in scientific technology." The conditions attaching to the award of this medal are that it is to be "for distinguished work in science or the arts, important development of previous basic discoveries, inventions or products utilizing important principles or of superior excellence, and for papers of especial merit that have been presented to the Institute, and published in its 'Journal.'" The medal is the highest gift the Institute have power to bestow; and in the present case it must be regarded not only as a great honour to the recipient for his work, but also as a recognition of British achievement in scientific technology on the part of the premier Institute of a kindred nation, where new applications of science are largely welcomed. Readers of the "JOURNAL" may remember that Dr. Bone had the honour of delivering a lecture on "Surface Combustion" before the Institute on Oct. 30, 1911, when he dealt with the subject before the members of the American Gas Institute at their annual meeting.

When noticing, in the "JOURNAL" for the 15th inst., the appointment of Mr. John G. Tooms, of Waterford, as Engineer of the Primitiva Gas Company of Buenos Ayres, it was mentioned that he was a member of the County Borough Technical Instruction Committee. In the letter announcing his resignation, he expressed to the Chairman and members his appreciation of the consideration they had shown him during the time he had had the honour of being associated with them. He said there was no sphere of his intercourse with the citizens of Waterford that had given him more pleasure and interest than that connected with the Committee. The Secretary was directed to write to Mr. Tooms and inform him that, while the Committee heartily congratulated him on his success, they regretted very much his leaving Waterford, and desired to thank him for the great service he had rendered to the cause of technical instruction.

It was announced in the last number of the "JOURNAL" that Mr. Charles Wilson, of Greenock, had been appointed Chief Assistant to the Aldershot Gas, Water, and District Lighting Company. Mr. Wilson, who is twenty-nine years of age, was educated at the Royal Academical Institution, Belfast, and subsequently entered Queen's College, where he was Scholar and First Prizeman of his year. He matriculated at the London University, with Honours, and pursued a three years' course of civil and mechanical engineering at the Central Technical College, South Kensington. He had practical training in engineering, &c., with the Consolidated Pneumatic Tool Company, the British Thomson-Houston Company, Messrs. Combe-Barbour, of Belfast, and the Barrowfield Iron-Works; and he was for eighteen months Assistant at the Greenock Gas-Works. Another change in the staff has been brought about by the Chief Clerk (Mr. J. M. Grundy) obtaining the position of Finance Clerk to the St. Helens Education Committee. He is succeeded by the Audit Clerk, Mr. Harry Barton, previously the Deputy Borough Treasurer at Macclesfield, whose position is filled by Mr. Philip Keeley, Accountant in the service of Sir S. A. Sadler, Limited, of Middlesbrough.

ELECTRICITY SUPPLY MEMORANDA.

THE electrical press ought to be heartily ashamed of itself for having given the electricity supply industry a nasty shock over the assumed coming of a 0·5 watt-hour per candle ordinary metallic filament lamp. The electrical industry is in a perpetually neurotic condition, owing to the peculiar uncertainty of its circumstances; and therefore it does not take much to give the jumps to its officials. There are undertakings that still feel the effects of the conversion from carbon filament lamps to metallic filament ones, especially undertakings in residential areas where there is no scope for business other than lighting, which business, such as it is, they cannot afford to carry on at less than 5d. to 6d. per unit. There are other undertakings, too, that are feeling very materially the method adopted by their consumers to lower the totals of their electricity bills by reducing the amount of light in their rooms. This they do by adopting smaller units—say, 16-candle (20-25 watt) ones. The Marylebone Electricity Department calculates that last year it dropped no less than £7000 of revenue through this method of retrenching on the part of its lighting customers. Then came the announcement of a ½ watt per candle (or rather Hefner unit) lamp; and the electricity industry trembled. Photometric tests show that the present metallic filament lamps have an actual efficiency of from 1·3 to 1·6 watt-hours per candle; so that a 0·5 watt-hour per candle lamp would mean a drop of 0·8 to 1·1 watt-hours per candle. That would be a very serious business for all the electricity suppliers; and the loss would want a good deal of making up. The singular thing is that the Electrical Press has not pointed out how such a lamp ought to make, even if it did not do so, the gas industry shake in its shoes; but the electrical scribes have been very busy urging the electricity industry to be of good cheer, for, with such a lamp, things must right themselves in the end. "Electrical Industries" thinks that, even if the lighting business should become demoralized for the electricity-supply industry, the cooking and heating business would help to bring things round. But it overlooks the fact that the business that would be dropped is of the 3d. to 8d. per unit revenue-producing character, and not of the 0·5d. to 1·5d. grade; so that the business that would have to be picked up in the latter line would have to be of an exceeding big order to produce compensation. The contemporary mentioned seems to fancy this would be a comparatively easy thing to obtain; for to it "the vigour with which" gas undertakings are "defending themselves against the electric-supply undertakings shows clearly that they realize how vulnerable is the cooking and heating position for gas." That savours somewhat of strong language off a weak chest. The same writer goes on to comfort himself with the exquisite thought that, "if the electric-supply undertakings prosecuted their advantage with equal vigour, the fight would be as good as finished even before the ½-watt lamp appeared." As the electricity supply industry cannot see its advantage in quite the same light as the confident writer in "Electrical Industries," it is not likely to enter into the matter with the same spirit with which the gas industry has developed its cooking business, and is now developing its water and room heating branches. The electricity industry fully realizes the deficiencies of its methods, though it only likes to talk of them in secret places; so that the fight is not likely to have the particularly one-sided conclusion that the writer in the electrical paper mentioned thinks possible.

That Point-Five Lamp.

A Partial Canard.

But after the electrical industry has been stirred to its very depths over the prospect of the advent of ordinary 0·5-watt lamps, and the Electrical Press has assiduously tried to administer a little comfort to central station engineers, it turns out that there is not the slightest cause for alarm on their part, for the promised lamp is not one that will penetrate the domestic domain. "Electrical Engineering" has found out that the 0·5-watt lamp, when it makes its first appearance, will certainly be of no smaller power than 1000 Hefner units. Indeed, that journal adds, it is quite probable that a start will be made by the A.E.G. Company with a 5000 Hefner unit (2500 watt) lamp, suitable for 110 and 220 volts; and the 3000, 2000, and 1000 candle power lamps will —also probably—follow suit. We can see the Illuminating Engineering Society promptly attacking these lamps on account of their high intrinsic brilliancy—that is to say, if the lamps come on to the market—and calling for their enclosure in satisfactory eye-screening devices, which will considerably alter their effective efficiency. It is considered that the 5000-candle power lamp will compete strongly with electric arc lamps for street lighting, and still more strongly for the lighting of large interiors—if the estimated life of 1000 to 1500 hours is attained. It is also mentioned that the Deutsche Gasglühlicht Aktiengesellschaft (the owners of the Osram lamp in Germany) are also developing a lamp on very similar lines. This likewise will only be for very high powers at the outset—1000 Hefner units and more—and possibly in this case for voltages below standard. In concluding its correction, "Electrical Engineering" has a cut at its premature, and partially informed, rivals. It says: "It is seen that the announcements and comments that have been made in the press with regard to the ½-watt lamp—suggesting that the lamp will invade the market in its millions, and be taken up rapidly by contractors and the public, and that the central station engineer will have to seek consolation in the fact that there are other uses for electricity than for lighting—are all based on incomplete information. No panic is necessary; and the enthusiasm is premature. All that will happen in the immediate future is that arc lamp manufacturers will have to prepare for even more serious competition than hitherto from the metal filament lamp." They are to be pitied; for they have been hard hit not only by electric metallic filament lamps, but by high-pressure gas-lamps.

General Cooking Directions.

Last week a book entitled "Simple Electric Cookery," by Miss May Little, was reviewed (p. 230); and it was seen how it was unintentionally shown by the book that electric cooking is not the "simple" thing represented. This week we have before us a pamphlet—price 2d.—giving some general directions for the use of electric cooking-stoves. This pamphlet is by Mrs. W. T. A. Cross—a lady with whom we have had a few friendly words on a previous occasion—or occasions. But really if Mrs. Cross had been Miss May Little, and Miss May had been Mrs. Cross, the lines of the pamphlet of the one and the book of the other could not have been of a much closer order than they are in dealing with the general subject. We desire, in the first place, to congratulate Mrs. Cross on having omitted from the pamphlet certain points that we have found in previous writings for which she has been responsible, and which were unjustifiable. There is in the pamphlet the customary laudation of the heat-retaining capacity of the electric oven, without explanation of why the current needs to be continued if there is no loss of heat from the oven. There is likewise warning regarding the maintenance of the bottoms of pots, pans, and kettles absolutely flat and unblemished, in order to obtain perfect contact with the hot-plate. Where is the gentle Sarah Ann? It is stated that the best saucepans to use for electric cooking are those made with aluminium, seamless steel, copper, or nickel; but there appears to be something against every one of these metals. Neither soda nor alcohol must be allowed to touch aluminium, as these dissolve the metal; the tin coating of the seamless steel utensils wears off after a time, and needs renewing if they are to be kept bright; copper vessels are excellent so long as the tin lining is renewed whenever required, otherwise these are dangerous to use, as some foods become poisonous on contact with copper; nickel saucepans are the best of all, but their price is somewhat against them. The relative heat conductivity of these metals is not mentioned. There is warning against thin saucepans that "cockle," as this makes the contact bad. There is acknowledgment that boiling is "the most expensive part of electric cooking; and it is not an economical plan to depend entirely upon electricity for the whole of the hot water required for domestic purposes." Coke-stoves are therefore recommended. That is kind to the gas undertakings. But why not gas-stoves; seeing that with them there is no solid fuel to provide and carry, and no trouble of lighting and cleaning up—nothing to do but to turn a tap, and ignite the gas, and there is an almost immediate supply of hot water available at any temperature desired? One thing Mrs. Cross points out as being important to remember is that the wires of the electric grill should never be touched with any metal, such as a knife, fork, or spoon. "To do so, would cause a short-circuit, and seriously damage the grill." Nothing else?

Shrinkage, Temperatures, and Cleansing.

We read in the pamphlet, as we read last week in "Simple Electric Cooking," the caution against frequently opening the door of the electric-oven, on account of the great need of conserving such dearly-generated heat. The window in the door, a lamp, and a thermometer are spoken of as aids to the imprisonment of the heat. There is the old meat shrinkage question dealt with in a less pugnacious way than is generally the case. Mrs. Cross simply (double sense) says that "meat cooked in an electric oven loses very much less weight than if cooked in any other way." The loss need not be less, it may be more; and by the "other way" the loss may be less than by the electric way. It all depends on the cook. "As most people know," says our learned friend, "not only water, but very valuable volatile essences are lost by evaporation during the cooking of meat." Really! That seems to be a wonderful thing. The "volatile essences" of meat! We must learn more about these "essences" that effect their escape when the exterior of a joint is properly coagulated. We know that essences—we will not call them "volatile"—sometimes escape when meat is cooked in a steam super-saturated atmosphere that has no means of exit from an oven. However, we must learn more of Mrs. Cross's volatile strangers. We take it they will be subject to analysis. We learn again of the "careful watching" that is necessary with electric cooking; but it is qualified here with a reference to when cooking a new dish for the first time. A new suggestion in cooking also comes before us. It is that in cooking "butchers' meat" (why "butchers'" meat?) the entire current should be switched off directly the joint is put in; and no current should be used until the thermometer has dropped to 210°. We take it the cook must sit on a stool in front of the thermometer, and just watch for the happy event. Then there must be no variation from "about" the 210° point till the joint is done. Let us see how this is to be managed.

The current is switched off until the 210° temperature is reached; then it must be switched on again to one of the partial stages, in order to keep the temperature at "about" 210°. How is this exquisite uniformity to be maintained electrically? Mrs. Cross recommends twenty minutes to each pound of meat (after heating up the oven) for red meats and rather longer for white meats! Practically the same as our friend Miss May Little. Therefore for a 10-lb. joint the cook must be on the thermometric watch for four or five hours, and possibly during the time she may relax her intentness sufficiently to occasionally pray that nothing untoward may occur—such as a collapse at the generating station, or a fuse in the house service or in the cooking equipment. Though electric-ovens are supposed by some electricians to never get dirty, and to never want cleaning, there are among the directions the very necessary ones for cleaning. One important thing to be guarded against is, Mrs. Cross tells us, the use of "much water" for cleansing purposes. But it would seem from her statement that the quantity of water should be of an immeasurable amount, as nothing more than a "damp cloth" is advised—the reason being that "if much water were to be used, there would be danger that some of it might reach the electric wires, which would be damaged by it."

New Kitchen Commandments.

It is clear there will have to be a great revision of the kitchen commandments to make electric cooking possible. Among them must be: "Thou shalt not bang nor in any wise ill-treat the expensive pots, pans, and kettles, for they must have level and not dented bottoms." "Thou shalt not use much water in cleansing the oven." "Thou shalt not fail to keep an eye on the thermometer for four or five hours for a 10-lb. joint." "Thou shalt not open the oven-door during the process of cooking." "Thou shalt not put soda or alcohol into aluminium vessels." "Thou shalt not use copper vessels when the tin lining shows signs of departing this life." "Thou shalt not object to an occasional shock." "Thou shalt not be troubled by the fact that various men lost their lives, last year and previous years, through contact with live wires at 200 to 250 volts." Again we thank goodness for the simplicity and conventional modes of gas-cookers.

The Point Five Defined.

The other week Mr. A. Nichols Moore wrote from Newport (Mon.) to the "Electrician," and gave his frank impressions of a Point Five [*ante*, p. 224]. He did it in a jocular manner; and some of the Point Fives are very angry with him, and show a particularly thin and sensitive skin. Mr. J. Horace Bowden, of Poplar, is one of these; but Mr. George C. Law, of East Sheen, occupies about a third of a column in our electrical contemporary with a piece of inane composition. In the course of the letter he does express one opinion. He says that he thinks that members of the electrical profession might leave such snapping and whining as Mr. Moore, in his (Mr. Law's) estimation, was guilty of, to the "JOURNAL OF GAS LIGHTING." We should have appreciated Mr. Law's testimony to the "Memoranda" still more than we do if his letter had been of a more robust character. Mr. Law knows that the so-called "snapping and whining" contains a considerable amount of truth, and truth is not palatable to certain people. Hence the varied names that truth receives. Some one a time ago said "the law is an ass," but that was before Mr. George Law's advent on this queer old sphere of ours. Some people of course have luck one way, and some another.

The Cost and the Profit.

It is proverbial that figures may be made to prove anything; but the following calculations are quite logical and interesting. By a paragraph that appeared last week, it was seen that it was admitted by the Hastings Corporation Electricity Department that the average cost per unit of electricity sold last year was 4·98d. (4·979d.). It is also stated in the accounts of the department that the average income from private consumers was 5·212d. per unit. Clearly the difference therefore must be profit; and this amounts to £696. It is also argued (thus deceiving the unwary and ignorant) that converting gas-lamps is a profitable investment at 2d. per unit, since it is all profit except the coal used—the current being charged at 2d. Here, again, since we know the current sold for the converted lamps and the cost of coal—namely, 0·861d. per unit sold—it is easy to calculate that the "profit" in this case is £906, making, together with the above obvious profit, £1602. Now the actual profit for the year according to the accounts is only £557. An explanation of what becomes of the other "profit" would be interesting. Admittedly, increased output is, under some circumstances, an advantage to an electricity undertaking; and there is justification in stating that the average total cost of 4·98d. per unit sold would have been more but for the fact of the public lighting. But it is easy from an examination of the figures in past years to see what the actual result of this benefit is; and it is really negligible when one takes into consideration the increased current sold to the private consumers at a higher average price than was the case some years ago.

Wires and Fires.

There was excitement on the battleship *Exmouth* on the morning of last Friday week. A fusing of an electric wire at the switchboard caused a fire. At first this was not considered serious; and the ship proceeded to sea to take part in the exercises of the squadron. The fire-transmitting power of electric wires does not appear to have been taken into calculation. The fire obtained greater hold. There was no flame; but there were considerable volumes of smoke, which was rendered more dense by the burning insulation of the electric cables. An engineer, specially dressed for the purpose, went below, and made an investigation. He found intense heat in the vicinity of three after-magazines; and in view of this ugly condition, the magazines were at once flooded. It was fortunate that this was discovered before greater damage was done, or there might have been a repetition of a certain French naval disaster. It is stated that several thousand pounds damage was incurred. And all through the fusing of an electric wire!

NOTES FROM WESTMINSTER.

WE are drawing near the close of the parliamentary work for the present session; and, on the whole, it has throughout been just about as dreary as it possibly could be. It is hoped that next session there will be a revival of some of the old interest. Something really new is wanted to give the legislative work of the gas industry a renewed attractiveness; and perhaps we may get it in Sir Corbet Woodall's hope, expressed at the Institution Meeting, that next session may see an important move in the suppression of the illuminating power standard for town gas, and the substitution of calorific value.

Middlesbrough Extension.

The Middlesbrough Corporation have done what we believed they would do, in connection with the North Ormesby Gas Company. The South Bank and Normanby Gas Company had, after the decision of Colonel Bathurst's Committee not to allow the Corporation to annex the areas of Eston and Normanby, no further interest in the Extension Bill; but for the North Ormesby Gas Company the position was different. When the Committee gave their decision regarding Eston and Normanby, the two Gas Companies were in negotiation with the Corporation over the question of purchase terms; and just terms have been agreed to with the only Gas Company that remained in opposition. The Corporation have relinquished their unexercised powers of supply in North Ormesby, and have consented to a limitation to two years as the period within which they may without opposition from the Company apply for purchase powers—the transfer to be on agreed terms, or as determined by arbitration. Therefore if the North Ormesby Company's undertaking is not purchased within two years, then the Company will exist with the Corporation powers of supply in their area completely abrogated. But so far as we understand the position, these powers of supply will continue in South Bank and Normanby; and if the Corporation buy the North Ormesby undertaking, the former Company will have the Corporation as neighbours. Even then, the Corporation are not likely to act unjustly to their smaller and less influential neighbours by putting into operation their long dormant supply powers within the outside districts.

The General Law and Spasmodic Alteration.

We are very glad to see that Colonel Bathurst's Committee adopted a properly strong position in relation to the opposition of the Essex County Council to the Rochford Rural District Council Bill, which proposes the transfer of their water undertaking to the Southend Water-Works Company. There is not the slightest question that the area affected by the change of ownership will profit considerably therefrom, as its supply of water will have at its back the guarantee of all the resources of the Southend Company. That is a substantially different position from the low-scale guarantee that exists under present conditions. The Essex County Council have secured from the Committee a merited rebuff. They wanted it badly in this case. In the House of Lords a clause was inserted in the Rochford Bill which altered the terms of the Water-Works Clauses Act in relation to the provision of a water supply. The Lords Committee resolved to change the 10 per cent. three-year guarantee on the capital outlay to five years. It is very unfair that changes of this kind should be made piecemeal, at the instance of an interested local authority. The success in this matter encouraged the County Council to apply to the House of Commons Committee for other modifications of the general law; but the Committee were inflexible, and not only declined to allow these but deleted the House of Lords clause referring to the percentage on capital outlay. They plainly told the County Council that they were not prepared to make any special changes from the general law without very sound cause was shown; and this the Council were unable to advance. The Council have lost a bit of money by this over-straining of their requirements. We wish promoters would also more often refuse to come to agreements with local bodies which alter the general law. They are rather prone to this sort of thing in order to avoid a little fighting; and this makes it worse for others to offer resistance.

PERSONAL.

Mr. THOMAS HAWKINS, who has received an appointment at Swanmore, Hants, under the Gosport Water Company, has been presented with a silver-plated tea-service by his former colleagues in the Fitting Department of the Naval Ordnance Works, in which he had served for sixteen years.

Mr. C. VALON BENNETT has been selected from upwards of 80 applicants for the position of Engineer and Manager to the Rochester, Chatham, and Gillingham Gas Company, and will shortly be entering upon his duties. He was trained at the Herne Bay Gas Company's works by his father (Mr. C. V. Bennett); and after serving that Company as Assistant Engineer and Manager for some years, he was appointed to a similar, but more important, position with the Dartford Gas Company. He is Second Lieutenant of the Fifth Battalion of the Queen's Own (Royal West Kent) Regiment.

OBITUARY.

A link connecting the present with the past of the Welshpool Gas Company has just been severed by the death, at the age of seventy-six, of Mr. D. P. OWEN. His father was Secretary of the Company, and deceased succeeded him; and he, in turn, was followed by his son, who now holds the position. He was a prominent figure in the borough, of which he was Mayor from 1872 to 1874.

The death occurred suddenly in London last Tuesday night of Mr. ANTHONY N. BRADY, an American multi-millionaire, reported to be worth between £16,000,000 and £20,000,000. He was interested in a number of undertakings, and, in association with other capitalists, acquired the gas-works at Troy, Albany, and Chicago. He was President of eight gas and electric light companies, and a Director of about thirty others.

THE GASLIGHT AND COKE COMPANY.

Half-Yearly Report and Accounts.

THE following is the report on the working of the Company during the six months ended the 30th of June, which, with the accounts (an abstract of which appears below), will be submitted to the proprietors on Friday.

The accounts for the past half year show that, after providing for fixed charges, setting aside £15,000 towards the redemption fund, and contributing £20,000 to the special purposes fund, there remains a profit balance of £397,087 12s. The amount brought forward from the previous half year being £712,387 4s. 10d., there is a total available balance of £1,109,474 16s. 10d., out of which the Directors recommend the payment of a dividend on the ordinary stock at the rate of £4 17s. 4d. per cent. per annum, which will absorb £398,742 1s. 2d. The sum to be carried forward to the credit of the current half year is £710,551 15s. 8d.

The sales of gas for the half year show an increase of 3¼ per cent. compared with the quantity sold during the corresponding period of 1912.

There has been an increase during the six months of 8959 in the number of consumers, and of 19,372 in the number of gas-stoves sold and let on hire.

The Directors have to report that contracts for the supply of coal to the Company extending over the next twelve months have been made at prices materially higher than those paid last year.

The Court of Directors sustained a severe loss, in March last, by the sudden death of Mr. Ulick John Burke, the Deputy-Governor, who had been a Director of this Company for 37 years, and of the Imperial Gas Company (prior to amalgamation) for 8 years, 45 years in all. They deplore the loss of a gas administrator of such great experience, and of a colleague and friend of peculiarly attractive personality. Mr. John Miles succeeds Mr. Burke as Deputy-Governor; and the vacancy in the directorate has been filled by the appointment of Mr. Henry Woodall, M.Inst.C.E.

The Court of Directors has been furnished by the several Engineers of the manufacturing and distributing departments with certificates that all the Company's works and plant have been maintained in thorough efficiency.

CORBET WOODALL, Governor.

Horseferry Road, Westminster, S.W., July 18, 1913.

The Accounts.

The accounts of the Company consist of the usual statements, from which we take the following particulars.

The statement of capital (stock) sets forth that the total paid up is £10,413,480; added on conversion, £12,832,955—total amount authorized, £23,246,435. Deducting the amount redeemed, £197,540, the total amount of the Company's existing capital powers is £23,048,895. The statement of loan capital stands thus: Total paid up, £3,186,660; added on conversion, £1,618,190; unissued, £750,000—total amount authorized, £5,554,850.

The capital account shows receipts (with premiums, £1,688,957 14s. 8d.) to the amount of £29,542,702 14s. 8d. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1912			£14,921,316 15 6
Expenditure during the half year to June 30, 1913—viz.,			
Buildings and machinery in extension of works	£3,910 19 6		
New and additional mains and service-pipes	3,971 11 4		
Do. do. meters	12,057 0 7		
Do. do. stoves	18,656 17 6		
		48,595 8 11	
			£14,969,913 4 5
By sale of surplus land	£266 9 0		
By depreciation of plant	777 11 2		
By depreciation of meters and stoves	58,877 10 0		
		59,921 10 2	
Total expenditure			£14,909,991 14 3
Nominal amount added on conversion			14,451,145 0 0
			£29,361,136 14 3
Deduct amount of capital redeemed under Company's Act of 1903			197,540 0 0
			£29,163,596 14 3
Balance of capital account			379,106 0 5
			£29,542,702 14 8

The following is the revenue account:—

Expenditure.

June Half Year, 1912.		£ s. d.	£ s. d.
	Manufacture of gas—		
£544,162	Coal, including all expenses thereon	861,573 13 1	
57,073	Oil ,, less value of oil tar	37,263 14 5	
53,040	Coke and breeze used in the manufacture of carburetted water gas	47,735 16 2	
17,328	Salaries of Engineers and other officers at works	15,918 13 11	
102,628	Wages	111,293 4 4	
15,421	Purification	18,510 16 1	
218,596	Repair and maintenance of works and plant, materials and labour, less received for old materials, £7813 18s. 10d.	234,316 17 9	
			1,261,612 15 9
	Distribution of gas—		
60,114	Salaries and wages of officers (including rental clerks)	60,357 16 11	
69,103	Repair and maintenance of mains and service-pipes, &c.	95,137 10 11	
80,763	Repair and renewal of meters	79,709 1 1	
87,956	,, ,, stoves	89,448 3 1	
29,427	Gas fittings, including labour (automatic meter supplies)	27,479 0 10	
			352,131 12 10
28,059	Public lamps—lighting and repairing	..	26,775 1 1
	Rents, rates, and taxes—		
7,084	Rents payable	7,105 12 2	
162,467	Rates and taxes	166,685 12 11	
			173,791 5 1
	Management—		
3,750	Directors' allowance	3,750 0 0	
312	Company's Auditors and Assistant	300 0 0	
10,053	Salaries of General Manager, Secretary, Accountant, and clerks	9,191 18 2	
27,352	Collectors and cashiers	26,730 14 3	
5,312	Stationery and printing	5,694 19 6	
6,254	General charges	6,500 0 10	
			52,167 12 9
	Co-partnership for 12 months to June 30, 1913	44,966 3 4	
22,869	*less* on account	22,000 0 0	
			22 956 3 4
249	Parliamentary charges	..	1,046 18 2
1,742	Law charges	..	1,299 12 4
6,633	Bad debts	..	6,410 13 4
500	Depreciation fund for works on leasehold lands	..	500 0 0
26,803	Annuities to officers and workmen, including contribution to officers' superannuation fund	..	27,281 17 4
16,058	Retiring allowances, &c.	..	..
2,680	Workmen's compensation account	..	2,702 4 7
..	Company's Contribution under National Insurance Act, 1911	..	4,274 14 3
	Public officers—		
1,270	Gas Referees and Official Auditor	1,258 9 9	
838	Public testing stations	630 16 8	
			1,889 6 5
£1,695,871			1,934,849 17 3
676,288	Balance carried to net revenue account		648,186 16 1
£2,372,159			2,583,036 13 4

Receipts.

June Half Year, 1912.		£ s. d.	£ s. d.
	Sale of gas—		
£1,573,333	Per meter, at 2s. 6d., 2s. 9d., 3s., and 2s. 2d. per 1000 cubic feet	1,634,013 4 0	
65,763	Public lighting and under contracts	64,239 5 4	
			1,698,252 9 4
£1,639,096			
70,412	Rental of meters	..	72,379 1 3
61,421	Rental of stoves	..	67,063 3 7
71,053	Rental of fittings	..	81,793 19 10
	Residual products—		
£308,135	Coke, less £35,963 17s. 10d. for labour, &c.	402,744 13 3	
25,581	Breeze, less £11,758 0s. 3d. ,, ,,	31,389 9 5	
72,755	Tar and tar products	94,592 0 1	
118,201	Ammoniacal liquor and sulphate of ammonia	129,011 9 2	
			657,737 12 9
£524,672			
£5,180	Rents receivable		5,497 16 7
325	Transfer fees		312 10 0
£2,372,159			2,583,036 13 4

The total of the net revenue account is £1,360,704 compared with £1,417,807 at June 30, 1912. The balance applicable to the redemption fund and to dividend on the ordinary stock is £1,124,474 16s. 10d.;

and the following statement shows how it is proposed to appropriate it :—

June, 1912.					
£739,832	..	Net balance brought from last account	£712,387	4	10
443,028	..	Net revenue for the half year	412,087	12	0
£1,182,860			£1,124,474	16	10
15,000	..	Contribution to redemption fund	15,000	0	0
(£4 17s. 4d. p. ct.)		Dividend on the ordinary stock—			
£399,452	..	£4 17s. 4d. per cent. per annum on £16,386,660 .	398,742	1	2
..		Forfeitures for deficiency in illuminating power	81	0	0
£768,408	..	Balance carried to next account	£710,551	15	8

The three statements relating to the reserve, special purposes, and depreciation funds stood as follows on June 30 : Reserve fund, £70,155 ; special purposes fund, £289,066 ; depreciation fund, £83,932.

The following statements relate to the working :—

Statement of Coal, &c., Used.

Description of Coal.	In Store Dec. 31, 1911.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1913.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common . . .	182,069	1,010,868	1,038,117	1876	152,944
Cannel	1,175	5,540	985	..	5,730
Total . . .	183,244	1,016,408	*1,039,102	1876	158,674

* In addition to this quantity of coal, 1,504,682 gallons of oil were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1912.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store, June 30, 1913.
Coke—tons	26,400	652,477	134,163	450,984	93,730
Breeze—tons	3,406	115,087	14,254	96,718	7,521
Tar, from coal only—galls.	1,457,272	10,091,649	9,966,796	556,919	1,025,206
Ammoniacal liquor—butts	27,652	302,332	294,856	139	34,989

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*15,107,888	472,744	13,327,436	13,984,999	46,080
†14,566,457	473,541	12,894,706	13,530,694	47,326

Including 2,409,754,000 cubic feet of carburetted water gas. † June half year 1912.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the half year as follows : Coal, £124,553 ; gas oil, £23,804 ; coke, £60,260 ; tar and ammoniacal liquor and products, £101,589 ; and sundries, £299,835. The figures this time last year were : Coal, £78,534 ; gas oil, £8713 ; coke, £19,100 ; tar, ammoniacal liquor, and products, £93,432 ; sundries, £272,340.

Mansfield's Wireless Pipe Locator.

In the "JOURNAL" for the 14th of January last (p. 98), we described and illustrated a portable apparatus devised by Messrs. Mansfield and Co., of New Brighton, Cheshire, for ascertaining the existence of water or the positions of pipes underground. Testimony was then furnished of the efficiency of the "locator;" and it has just been supported by Mr. F. J. Dixon, the Water Engineer of the Ashton-under-Lyne, Stalybridge, and Dukinfield District Water-Works, who has put the apparatus under some severe trials for the purpose of locating water-mains. The last test he made was over a length of 400 yards, when the receiver showed the position of the pipe in several places; and on getting down at the point indicated, he immediately dropped on the main. Mr. Dixon says he has also used the "locator" for finding service-pipes under concrete foundations and flagged yards, with the same satisfactory results. We are informed that at the recent congress of the Royal Sanitary Institute, the Judges selected this apparatus as being a fit subject for trial, and that they are arranging for a practical demonstration with a view to an award of merit.

Industrial Poisoning.—We have received from Mr. Edward Arnold, of Maddox Street, W., a work on "Industrial Poisoning from Fumes, Gases, and Poisons of Manufacturing Processes," by Dr. J. Rambousek, Professor of Factory Hygiene and Chief State Health Officer at Prague. The text has been translated and edited by Dr. Thomas M. Legge, the Medical Inspector of Factories. In his preface, the author says his book "is intended for all who are, or are obliged to be, or ought to be, interested in industrial poisoning;" and Dr. Legge considers that no words could better describe its scope. We hope to notice the contents more fully in a subsequent issue. Meanwhile, we may say that they occupy about 340 octavo pages, and are followed by a useful appendix of references and an index. The price of the book is 12s. 6d. net.

JERSEY GAS COMPANY AND ELECTRIC LIGHTING.

Scheme for St. Helier.

THE Parochial Authority of St. Helier, the capital of Jersey, have under consideration a proposal put forward by the Jersey Gas Company for the establishment of an electricity supply undertaking for the town. Other propositions emanating from this side of the Channel have been mooted at different times, but the projected schemes never got beyond the preliminary stage until the Gas Company, with Messrs. Corbet Woodall and Son, their Engineers, took the matter in hand. In the early part of the present year, the Gas Company retained the services of Messrs. May and Hawes, Consulting Electrical Engineers of Westminster, and, on the warrant of the scheme which the firm have prepared, the Company's Manager (Mr. Harry Morris) has addressed the following notification to the Principal of the Parochial Authority :—

> I have the honour to advise you that the Jersey Gaslight Company, Limited, have decided to apply to the States for powers, which were originally contemplated in the Bill now before the Assembly, to enable them to supply electricity for light and power. I have, at the same time, to ask you to be good enough to ascertain whether the town of St. Helier will be prepared to grant the necessary facilities to enable the present Company to undertake the commencement of the work. We have recently placed ourselves in the hands of a firm of Consulting Electrical Engineers, who have had a vast amount of experience in such matters, and have been advised that the Gas Company are undoubtedly in a position to furnish such a supply on terms more favourable to the public than any other undertaking can hope to do.

In submitting their proposals to the Parochial Assembly, the Company recognize the possibility of objections being raised to the supply of both gas and electricity being under the same control ; but they point out that such objections have for some time ceased to have effect in England, and that, as a matter of fact, the British Parliament and the Board of Trade are now showing themselves favourable to such dual control by the number of Acts and Electric Supply Orders which have been granted to English Gas Companies. The Company have taken the bold course of offering to submit the details of their scheme to the Board of Trade for their examination and approval, and have suggested to the Parochial Assembly that, if any other properly guaranteed offer be forthcoming, the Board of Trade should be asked to hold a local inquiry into the merits of the proposals and their suitability for meeting the requirements, to hear the evidence in support of the schemes from the respective technical advisers, and the representations of any interested parties, so that the town may be assured of an impartial opinion as to the most advantageous scheme from the public point of view.

The Gas Company undertake to commence constructional operations immediately the powers are granted, and to start the supply of electricity within two years at the latest, upon a scale of charges not exceeding the rates of 5d. per unit for residential lighting, 4½d. per unit for business lighting, and 1½d. per unit for power and heat, with special rates for large and high load-factor supplies. These rates of charge are extremely moderate for a town so far removed from the coalfields as St. Helier, where the prices not only of fuel, but also of plant, mains, and other materials used in connection with the generation and supply of electrical energy, are likely to be inflated by the dual costs of inland transit and the freight charges of the Channel boat services. Slot-meters will be available for the smaller classes of property; and public lighting will be undertaken if required by the Parochial Authority.

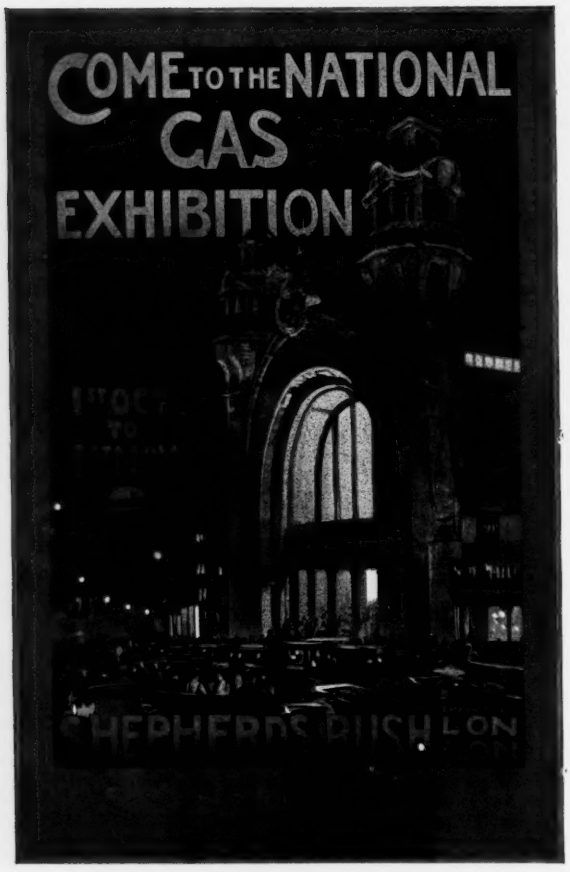
It is proposed to establish the undertaking on the direct-current three-wire system, with a pressure of 240 volts for lighting and of 480 volts for power purposes. The generating station will be erected on the site of the old gas-works. For the initial equipment, the generating plant will be in duplicate, of 200 kilowatts capacity ; and there will be a large battery of accumulators, which is to be capable of dealing with the entire supply for a prolonged period, while provision is to be made, both as regards accommodation and the design of the principal auxiliary plant, for the introduction of a third generating set of 200 kilowatts capacity as soon as the demand necessitates it. Underground mains will be used throughout. As part of the compulsory works, the Company have undertaken to lay down at the commencement 1½ miles of feeder mains and 4½ miles of distributing mains in the principal streets of the town.

For a town of the size of St. Helier, the scheme appears to be a thoroughly comprehensive one for a commencement ; and we imagine that it will secure the cordial approval of the town authority. If a public supply of electricity be desired by the town, as apparently it is, there can be no shadow of doubt that the Gas Company—a concern of financial stability and high repute—with the advantage of an established public-service organization, are capable of meeting the requirements quite as effectively as, and certainly more economically than, a separate undertaking.

The Jersey Gas Company's proposals have been developed under the advice of their Advisory Engineers, Messrs. Corbet Woodall and Son, of Westminster, and Mr. Harry Morris, their Resident Engineer and Manager at St. Helier. Messrs. May and Hawes, who are handling the scheme for the Gas Company, are well-known electrical experts, with a large professional connection among municipal authorities and electric companies.

NATIONAL GAS CONGRESS AND EXHIBITION.

Meeting of the General Committee—Report of the Executive Committee.



Photographic Reproduction of the Poster (Large and Small Size) Prepared for Mural Advertising in Local Gas-Supply Areas.

[See Report of the Executive Committee below.]

THE General Committee of the National Gas Exhibition met last Thursday, at the Trocadero Restaurant, to receive the report of the Executive Committee, and to transact other business.

On the motion of Sir CORBET WOODALL, the President of the Exhibition, seconded by Mr. F. TEMPLER DEPREE, Mr. EDWARD ALLEN (Liverpool), the President of the Institution of Gas Engineers, was voted to the chair.

MINUTES OF LAST MEETING.

Mr. F. W. GOODENOUGH, Chairman of the Executive Committee, remarked that the report of the last meeting as published in the "JOURNAL OF GAS LIGHTING" had been adopted by the Executive Committee as the record of the minutes of that meeting; and he suggested their confirmation.

This was unanimously agreed to.

THE OPENING OF THE EXHIBITION.

Mr. GOODENOUGH read a letter from the Lord Mayor of the City of London (the Right Hon. Sir David Burnett), cordially consenting to open the National Gas Exhibition and Congress in civic state on Monday, Oct. 1, at twelve o'clock noon. The Lord Mayor of Cardiff and the Lord Provost of Edinburgh had also signified their intention to be present. They were hoping to receive replies very shortly from the other Lord Mayors and Lord Provosts who had been invited.

The CHAIRMAN said it was gratifying to know that the Exhibition was going to be patronized by men in such exalted position in civic life. He hoped they would also secure the presence of the Lord Mayors of Manchester, Leeds, and Liverpool.

"ANCIENT LIGHTS."

Mr. GOODENOUGH next announced that the Library Committee of the City Corporation had consented to loan to the Exhibition their collection of ancient lamps.

REPORT OF THE EXECUTIVE.

The CHAIRMAN said he was afraid those present had not had time to read the report of the Executive Committee: and therefore he would ask Mr. Goodenough to read it. He had been responsible for it; and, with the Vice-Chairman of the Committee (Mr. H. M. Thornton), he deserved great credit for it.

Mr. GOODENOUGH read the report as follows:

"In presenting their second report of progress made with the organization of the forthcoming National Gas Exhibition, the Executive Committee have pleasure in stating that good headway has been made with the work, and that all arrangements are well in hand.

ALTERATION OF NAME.

In order more accurately to describe the enterprise, it has been decided to alter the name from "The National Gas Exhibition" to "The National Gas Congress and Exhibition."

PATRONAGE.

The Committee have the honour to report that the Gas Congress and Exhibition has been accorded the patronage of Their Majesties the King and Queen and of Her Royal Highness Princess Louise, Duchess of Argyll. The patronage has also been secured of a large number of distinguished men and women, of whom a list to date is submitted herewith.

OPENING CEREMONY.

The Committee are pleased to be able to announce that the Lord Mayor of London has kindly consented to attend at noon on Oct. 1, in civic state, to perform the ceremony of opening the Congress and Exhibition. Letters have been sent to the sixteen other Lord Mayors and Lord Provosts who have given their patronage to the Exhibition, inviting them to be present to support the Lord Mayor of London at the opening ceremony.

VISITORS.

The letters of invitation sent to gas undertakings in foreign countries and British Dominions Over Seas have resulted in a very satisfactory response; and it is hoped that there will be a good attendance of visitors on Empire Day and International Day.

The majority of the District Associations and Institutions of Gas Engineers and Managers have adopted the suggestion of paying an official visit to the Exhibition. Efforts are being made to secure travelling facilities at reduced fares for all attending conferences at the Exhibition; and it is hoped that, if these are secured, they will be of service to members of the District Associations when paying their official visits. A list of recommended hotels and boarding-houses conveniently situated for access to the Exhibition is being prepared, and will be available for the use of visitors.

PLANS.

The work of arranging all the details of gas appliances, fittings, &c., to be installed in the Exhibition is well in hand; and conferences are taking place with the manufacturers with a view to the detailed allotment of positions being finally arranged in a manner satisfactory to all. This work will be completed by the end of this month.

The Committee desire to place on record the excellent spirit of co-operation and "give-and-take" which is being displayed throughout this by no means easy work of arranging the details of a co-operative exhibition unique in principle, and of unprecedented magnitude.

CONFERENCES.

In connection with the Conferences to be held during the Congress, the Committee are pleased to report that the following papers have already been promised:—

"PLANNING, BUYING, AND COOKING FOR THE WORKING MAN'S TABLE."—Hints as to food values, relative costs, and economical cooking methods. By C. HERMAN SENN, Hon. Director of the Cookery and Food Association.

"THE COOKERY CLASS IN ITS RELATION TO THE HOME."—How to improve the working man's table through the working man's child, and thereby raise the standard of national health and physique. By Miss MABEL ATKINSON, M.A.

"THE PENNY-IN-THE-SLOT METER AS THE WORKING MAN'S FRIEND."—How to get the greatest cooking value for a penny. By Mrs. MARGARET M'KILLOP, M.A., Sommerville College, Oxford.

"SMOKE AS A DESTROYER OF FINE ART." By Sir WILLIAM RICHMOND, K.C.B., R.A.

"THE LOSS TO HEALTH AND POCKET CAUSED BY THE SMOKE NUISANCE."—The Question of Remedies. By Sir WILLIAM H. BENNETT, K.C.V.O., F.R.C.S.

"THE GAS INDUSTRY IN RELATION TO SMOKE ABATEMENT." By Professor VIVIAN B. LEWES, F.I.C., F.C.S.

"WHAT THE COAL SMOKE ABATEMENT SOCIETY HAS DONE AND WHAT IT COULD DO." By H. A. DES VŒUX, M.D., &c. (Treasurer of the Coal Smoke Abatement Society).

"THE SCHOOL OF THE FUTURE."—Its lighting, heating, and ventilation. By SEPTIMUS WARWICK, F.R.I.B.A., and AUSTEN HALL, F.R.I.B.A.

"SOME CONSIDERATIONS ON THE APPARENT BRIGHTNESS OF LIGHTS." By Professor SYLVANUS THOMPSON, D.Sc., F.R.S., &c. (President of the Illuminating Engineering Society).

"THE HYGIENE OF GAS FOR LIGHTING."—Notes on research upon the hygienic value of gas as an illuminant. By SAMUEL RIDEAL, D.Sc., F.C.S., &c.

"THE HEALTH VALUE OF RADIANT HEAT."—Notes on research upon various types of heating appliances, having special regard to the comparative health values of heating by convection and by radiation. By Professor LEONARD HILL, M.B., F.R.S., &c.

"MODERN IMPROVEMENTS IN GAS LIGHTING AND HEATING APPLIANCES." By Professor VIVIAN B. LEWES, F.I.C., F.C.S.

"LIGHT AND SIGHT."—The effect of wrongly-placed and unshaded lights on the eye. By MEREDITH YOUNG, M.D., D.P.H., &c.

"THE ECONOMY OF EFFICIENT LIGHTING."—Good lighting as an aid to increased output and a safeguard against accident. By FRANKLIN THORP.

"The Aims and Objects of the Illuminating Engineering Society." By Leon Gaster (Hon. Secretary of the Illuminating Engineering Society).

"Domestic Service as a Career for Gentlewomen."—How the substitution of gas for coal affects the domestic service problem. By Mrs. M. A. Cloudesley Brereton, Officier d'Académie.

"Fuel and Light in the Working Man's Budget." By Mrs. Margaret M'Killop, M.A.

"Coal Gas as a Fuel for Domestic Purposes." By F. W. Goodenough, Chairman of Exhibition Executive. (Based upon Cantor Lectures delivered before the Royal Society of Arts, March, 1913.)

"Co-Partnership as a Means of Increasing the Prosperity of Both Capital and Labour." By Aneurin Williams, M.A., J.P.

"The Relation of Science and Industry." An account of the work of the Imperial College of Science and Technology. By Surg.-Gen. Sir Alfred Keogh, K.C.B., LL.D., &c.

"Co-operation between the School and the Employer." By Cloudesley Brereton, M.A., and D. Milne Watson, M.A., LL.B.

"Natural Law in the Commercial World." By A. F. Sheldon.

"The Lighting, Heating, and Ventilation of Factories and Workshops." By Professor Vivian B. Lewes, F.I.C., F.C.S.

"Gas as a Fuel for Industrial Purposes." By Professor W. A. Bone, D.Sc., F.R.S.

"The Economic Value of Adequate Illumination." By Leon Gaster (Hon. Sec. of the Illuminating Engineering Society).

As soon as the list is completed, a programme of the whole series of Conferences will be published.

It is confidently anticipated that the holding of these Conferences (which will necessarily ensure a very considerable amount of general Press publicity) will have the effect of bringing home the truth in regard to the hygienic aspect of the utilization of gas for lighting and heating, and of emphasizing the large and varied sphere of usefulness now occupied by gas in both domestic and industrial life, to a very large number of those who are moulders of public opinion, in regard both to the present and to future generations.

On this ground alone, the National Gas Congress and Exhibition will justify its title, and will deserve the whole-hearted support of every Director of every Gas Company, of every Member of every Gas Committee, and of every Gas Manager, Engineer, and Secretary in the British Isles; and it is hoped that the value of this enterprise to the future prosperity of the gas industry will be appreciated universally in time to secure for the scheme the financial support which is necessary to ensure its complete success, and to enable its organizers to do all that needs to be done to make it of as full value to the industry as it is possible to be if adequately supported.

Finances.

Up to the present, the following support has been guaranteed:

Society of British Gas Industries, £11,675 Other exhibitors £410	£12,085	0	0
Gas Undertakings (British Islands)	9,418	10	0
" " (Foreign and Colonial) . . .	603	3	0
Manchester District Institution of Gas Engineers .	5	5	0
Technical Press—"Journal of Gas Lighting" and "Gas World"	21	0	0
Coal Owners	258	15	0
Total	£22,391	13	0

To this has to be added the estimated receipts for admission. But this is a very uncertain quantity, and should constitute a reserve to meet emergencies during the course of the Exhibition, or to become divisible surplus at its close.

The minimum amount required to meet the expenses of the Exhibition is £26,000; while £30,000 could be expended upon it with advantage to the industry. It will be seen, therefore, that over £3500 still remains to be subscribed before the minimum requirement is reached; and, it should be added, it is the last few thousand pounds required which are the most important of all, as being necessary to secure adequate publicity for the Exhibition, and so ensure its prime object—a full attendance of the public.

The Executive Committee feel confident that, upon the scope and possible influence of the enterprise becoming more fully realized throughout the country, now that their plans are fully developed in detail, the balance of guarantee required will be speedily forthcoming.

Local Publicity.

Posters, circulars, post-cards, advertising stamps, and invitation tickets have been prepared for the use of undertakings in giving publicity to the Exhibition locally; and a considerable volume of orders has already been received. It will greatly facilitate arrangements with the printers if all undertakings will place their orders at the earliest possible date. Copy suitable for advertisements in the local Press has also been prepared, and will be shortly circulated; stereos of such advertisements will be available for the purpose at a reasonable price. Advertising the Exhibition locally serves the purpose also of bringing gas prominently before the notice of consumers.

Lectures.

A programme of popular and scientific lectures is in course of preparation; and it is proposed to deal with the following subjects:

- How Gas is Made and Distributed.
- How Gas is Measured. (The making, testing, and working of a gas-meter.)
- The Making of a Gas-Mantle.
- The Use and Abuse of Light.
- The History of Fire-Making.
- Power and Heat for Factory Use.
- The Silent Servant. (Gas in relation to the Servant Problem.)
- A Pennyworth of Gas. (The Slot Meter as the Worker's Friend.)
- A Bowl of Water. (The subject of radiant *versus* convected heat.)

Suggestions as to other subjects suitable for these lectures will be gladly received and considered by the Executive.

Cookery Lectures and Competitions.

The Sub-Committee dealing with the question of Cookery Lectures and Competitions have made good progress with their arrangements, in which they are being actively assisted by a number of ladies of experience in this branch of gas publicity. A detailed programme will shortly be published, which will include arrangements for competitions for School Children, Boy Scouts, Girl Scouts, Soldiers, Sailors, Nurses, Cooks, and Housewives.

Photographs.

A large number of photographs of typical installations of gas lighting, heating, cooking, power, and furnace work, &c., are being got together by the assistance of many of the subscribers; and arrangements are being made for the display of these photographs in an attractive manner in different parts of the Exhibition.

Historical Section.

A number of objects of historical interest are being collected, and will be shown in the first Hall. This exhibit will include a collection of Roman and Mediæval Lamps and other lighting appliances which the City Corporation has kindly consented to loan to the Committee. Another collection of specimens illustrating the history of artificial light production, kindly lent to the Committee by Mr. Edward Lovett, and also a comprehensive collection of specimens illustrating the history of fire-making from earliest times, which Mr. Edward Bidwell* has been so good as to lend to the Committee. In each of these cases the only expense entailed will be the provision of the necessary show-cases, the cost of carriage to and fro, and the insurance of the exhibits. Promises have been received of the loan of a number of interesting portraits of celebrities in the gas world, past and present.

Fitting and Maintenance Work.

A contract has been placed with Messrs. Simmonds Bros., Limited, for the constructional work in the Exhibition; and the gas-fitting and maintenance work has been undertaken by the Brentford Gas Company and the Gaslight and Coke Company, working in co-operation—these Companies lending all material required free of charge, the expense being limited to the cost of labour only.

Attendants.

One of the most important details in connection with the Exhibition—namely, that of the provision of an adequate staff who will answer the inquiries of, and give information to, the general public—is being provided for by the generous co-operation of a considerable number of the subscribing gas undertakings. The appeal for assistance in this direction issued by the Committee has met with a most gratifying response so far as replies have been received; and it is hoped that by the time all those who have been approached in the matter have given their decision, a sufficient staff for the purpose will have been secured. The necessary number of nurses and other women attendants for dealing with certain sections of the Exhibition will, of course, have to be paid for; and steps are being taken to secure the services of efficient attendants for this purpose. Arrangements are being made to ensure that the time spent by members of the staff of gas undertakings lent for the purpose of assistance at the Exhibition will be as full as possible of profit and instruction to those representatives.

For the Executive Committee,

F. W. Goodenough, *Chairman.*
H. M. Thornton, *Vice-Chairman.*

The Chairman proposed, and Mr. H. M. Thornton seconded, the adoption of the report.

Sir Corbet Woodall remarked that they ought not to pass the report without some comment. It seemed to him that it was one of the most capable and thorough he had ever had the pleasure of reading. It was quite clear the Executive Committee were very much in earnest; and if the tone of the report was maintained throughout the work that had to be done between now and the opening of the Exhibition, the success of it was certainly assured. The last paragraph especially showed a prudent determination on the part of the Committee—inviting gas companies to send show-room attendants and others to assist in explaining and making clear to visitors the exhibits they would see before them. The report mentioned that this had met with a most gratifying response from the companies; and it was to be hoped that, by the time all those who had been approached in the matter had given their decision, a sufficient staff would have been provided. He felt quite sure that the embarrassment the Committee would have to face would be that a greater number of helpers would be forthcoming than they would have use for, because it would be recognized by the companies that, in complying with the request of the Committee, they would be doing a service not only to the gas industry through the public, but that they would be doing a material service to their own undertakings. The amount of information the men would gather from their attendance at the Exhibition would be of enormous advantage to the companies who sent them for the purpose in view. He (Sir Corbet) was pleased to note that arrangements would be made so as to secure that the men's time did not hang on their hands. It was, he understood, proposed to make arrangements so that, apart from the duty at the Exhibition, the men would be able to acquire information by conferences, and so forth, among themselves. Throughout, the report showed that the Committee were taking themselves and the Exhibition seriously; and he hoped the tone of the report would be continued during the Exhibition.

The Chairman said he should like to say how very much they appreciated the encouraging words that Sir Corbet Woodall had addressed to them. In addition, he (Mr. Allen) would simply say that he hoped those present would note that there was a balance required to reach the minimum fund of £26,000; and, through the help of those present and other courses to be pursued, they were

* Mr. Bidwell is a shareholder in the Gaslight and Coke Company.

hoping to attain the end in view. The issue of the report to the (at present) non-contributing undertakings would, it was hoped, bring in more subscribers. If all those present would do their best to work for the raising of the money required, it would encourage very greatly not only the Executive, but the Chairman of their Finance Committee, Mr. D. Milne Watson. From the beginning, Mr. Watson had been very particular regarding this question of finance; and he had almost hesitated, as Chairman, to go forward unless he could feel assured the expenses had been met. This had been one very strong point all through—that while being enthusiastic, they had been prudent. The Chairman of the Committee (Mr. Goodenough) had also put in a great deal of work and enthusiasm. He (Mr. Allen) sincerely trusted the £26,000 would soon be realized.

Colonel H. Oakden Fisher (Cardiff) thoroughly endorsed all Sir Corbet Woodall had said. Everything was going on satisfactorily; and he believed the hopes expressed by the Chairman, as to realizing the full amount of the subscriptions, would be satisfied.

Mr. Goodenough observed that it was proposed to circulate the report, with a further appeal for monetary assistance, to all non-subscribing undertakings. He hoped that this would achieve the desired result.

Mr. Hubert Pooley (Leicester) thought a few words ought to be uttered thanking Mr. Goodenough for the great care he had taken in framing the report. It was so full that it lacked nothing; and, in saying this, he felt he could give it no better praise.

The Chairman remarked that he did not want those present to think for one moment the Executive were at all in doubt as to the financial success of the Exhibition, or that they had any lack of hope as to the raising of £26,000.

Mr. W. D. Helps: £30,000!

The Chairman: And as much more beyond the £26,000 as possible. But £26,000 was required. The Committee were not at all discouraged; they simply wanted more. They were quite satisfied with the financial progress so far; but they would not feel fully satisfied until they could say, as a Frenchman would do, "*Complet, Monsieur.*" The Committee felt quite cheerful, and were determined to do better.

The motion was unanimously carried.

Next Meeting.

The Chairman said it had been suggested that the next meeting of the General Committee should be held on Monday afternoon, Sept. 22, at three o'clock, at the same place.

The proposal met with acceptance.

Vote of Thanks.

On the motion of Mr. Goodenough, seconded by Colonel Fisher, a hearty vote of thanks was passed to the President of the Institution for taking the chair.

THE OPTICAL CONVENTION OF 1912.

The volume of proceedings of the Second Optical Convention, which was referred to in the "Journal" for July 22 (p. 228), contains very little matter of direct interest to gas men.

It opens with the inaugural address of the President, Professor Silvanus P. Thompson, F.R.S., in which he reviewed the progress made in the optical industry since the holding of the First Optical Convention in 1905. In a brief reference to illumination, he commented on the great activity in the development of this branch of optics; on the fact that international agreement on the unit of light had been practically attained; and on the requirement of a minimum illumination in schools, libraries, factories, public buildings, and streets. The address also mentioned researches which were being carried out in connection with radiation by incandescent bodies, and that proper recognition was being given to Lummer's work on the radiation of the ideal black body. The President regretted that there were so few opportunities in this country for a proper study of, and training in, technical optics. He said that what was wanted was an establishment where theory and practice would go hand in hand; where the mathematician would himself grind lenses and measure their performance on the test-bench; where braincraft would be married to handcraft; and where precision, whether in computation or in workmanship, would be a dominating ambition.

Of the papers (35 in all) included in the volume of proceedings only one—that by Messrs. Dow and Mackinney, on "Advances in the Measurement of Light and Illumination"—is on a subject which appeals directly to our readers; and an abstract of this paper was given in the "Journal" at the time of its presentation at the Convention [Vol. CXIX, p. 43]. The paper, as printed in the proceedings, however, is accompanied by seven figures; and many photometrists may be glad to read it there in full.

A paper by Messrs. A. C. Jolly and A. J. Bull, on the "Measurement of Colour," is suggestive in regard to the problem of obtaining a numerical expression of any ordinary colour, for which Lovibond's Tintometer and Ives's Colorimeter are at present the only appliances available for commercial work. Two papers on colour-mixing apparatus are also included in the volume.

Gas men who are specially versed in optical science will find many other papers in the volume worthy of study. It is published for the University of London Press by Hodder and Stoughton.

THE MOND AMMONIA RECOVERY PROCESS.

A prospectus was issued last week of "Natal Ammonium Limited," a Company which has been formed with the Right Hon. the Earl of Selborne as the Chairman, and Messrs. Emile S. Mond and Robert Mond on the Board, to acquire and work certain coal-seams in the Vryheid District of Natal, with the object of using the coal in Mond producers with bye-product recovery plant. The Power Gas Corporation, Limited, have tendered for the supply of this plant; and the Consulting Engineers of the Company have advised the acceptance of the tender. The plant which it is proposed to erect will deal with 150,000 tons of coal per annum for the recovery of sulphate of ammonia and other "bye-products." The analysis shows that the coal contains on an average over 2 per cent. of nitrogen. The estimate of profits is based solely on the production of sulphate of ammonia from the coal; and the value of the gas and other bye-products—tar, pitch, and oils—which will be produced, is not taken into account. The prospectus is very interesting as supporting the view which has been several times put forward in the "Journal," that the Mond producer process is first and foremost an ammonia producing process, and that the gas is only a bye-product. The correctness of these views has, however, in the past been challenged by those connected with the Mond producer schemes. In the case of the Natal Company, the gas is, in fact, being treated as a bye-product which will be utilized only if opportunity occurs.

Collected Researches of the National Physical Laboratory.

We have received from the National Physical Laboratory Vols. IX. and X. of the Collected Researches. Each volume contains about 250 large quarto pages, embodying results of a vast amount of work. The earlier volume contains twelve papers, one being on "Experiments on the Strength and Fatigue Properties of Welded Joints in Iron and Steel," by Dr. T. E. Stanton, M.Inst.C.E., and Mr. J. R. Pannell, reprinted from the "Proceedings" of the Institution. The other volume contains eleven papers, one, entitled "Measurements and Notes on the Visibility of Point Sources of Light," by Mr. Clifford C. Paterson, Assoc. M.Inst.C.E., and Mr. B. P. Dudding, being their communication to the joint meeting of the Physical Society and of the Optical Convention last year.

Conveying Coal by a Pipe-Line.

Particulars were given in a London daily paper quite recently of a new method of conveying coal from the barge into the works, by means of water pressure through a pipe, which has been devised by Mr. G. G. Bell, the Electricity Engineer to the Hammersmith Borough Council. It is claimed that by the arrangement, which has been favourably reported upon for the Council, from 30 to 60 tons of coal per hour can be driven through an 8-inch pipe leading from the Thames to the yard of the electricity works in Fulham Palace Road—a distance of 600 yards. If the scheme is adopted, a large mixing-tank will be erected by the coal-wharf. A mechanical grab will lift the coal from the barge, and after passing into an automatic weighing-machine the coal will be filtered into the tank, which will contain 15 per cent. of coal and 85 per cent. of water. A powerful electrically driven pump will force the mixture at high velocity through the transmission tube to a reception-tank at the works. The coal will sink to the bottom, and another pump will drive the water through a return pipe to the mixing-tank, while another grab will lift the coal out of the reception-tank into the storage department. The whole process is automatic, and the water is used over and over again. Though the initial cost of the plant will be approximately £10,000, it is estimated that in time the money will be saved over and over again. At present the cost of transport is approximately 7d. a ton, or about £729 for the 25,000 tons used in a year.

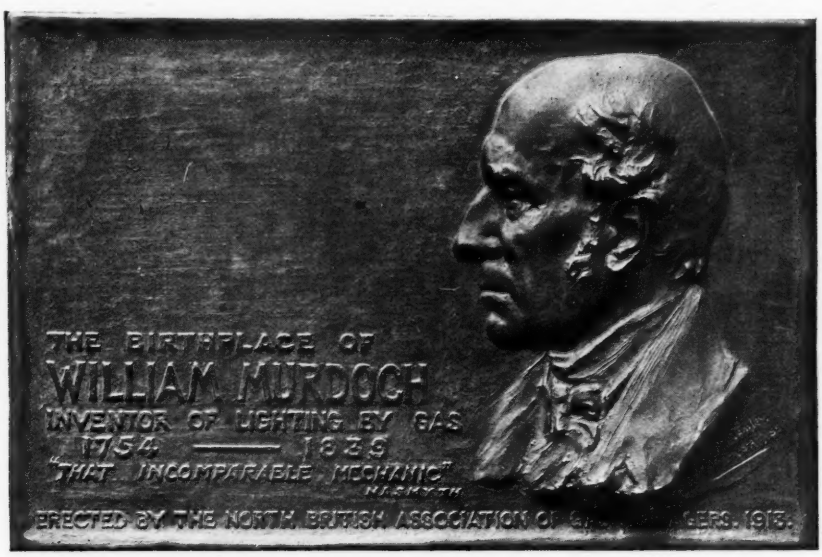
Turning Oxide of Iron for Revivification.—We have received from Mr. William Arnott, the Manager of the South African Lighting Association, Limited, two photographs showing an ingenious method he has adopted of turning over and revivifying his oxide of iron in the purifying yard. Instead of using an ordinary shovel, he employs a plough made on the harrow principle; and he says that with it he can turn over and expose to the air more oxide in an hour than he could do in a day by the usual process. The photographs show the plough being drawn by two Kaffir stokers; and they furnish an illustration of the devices adopted in gas-works in countries thousands of miles away.

Gas Coal Contract Conditions.—According to the "Iron and Coal Trades Review," proposals have been made by collieries to alter the coal contract conditions formulated by the Gas Coal Sales Association by striking out the clause with regard to the delivery of arrears, and substituting for it a clause that the delivery should be by mutual arrangement. It is also proposed to put in a section reducing deliveries in proportion to the reduction that might take place in the "get" of the miners. Thus, if the total "get" of the men in a particular month was 20 per cent. below that of the previous year, 20 per cent. would be deducted from the monthly contract quantities; and the gas-works would not be entitled to ask for the arrears until the termination of the contract period. It is also desired that the summer and winter deliveries should be in equal monthly quantities.

THE MEMORIAL TABLET TO WILLIAM MURDOCH AT LUGAR.

Unveiling Ceremony.

THE unveiling of the bronze memorial tablet to William Murdoch (or Murdock) which has been fixed upon the wall of the house wherein he was born, was fittingly attended by the Presidents of many of the principal Gas Associations, such as Mr. Edward Allen, of Liverpool (Institution of Gas Engineers), Mr. James M'Leod, of Greenock (North British Gas Association), Mr. W. Wilson, of Falkirk (Scottish Gas Managers' Informal Meeting), Mr. W. H. Roberts, of Newtownards (Irish Association), and last, but by no means least, the "Grand Old Man" of the gas industry, Mr. Thomas Newbigging. Mr. George R. Hislop, of Paisley, used a few well-fitting words in performing the unveiling ceremony, wisely reserving his detailed appreciation until after the luncheon. The photographing of the company, and the examination of the cave in which many of the earliest experiments in gas making were carried out, followed, after which the Lugar Institute was visited, where luncheon was laid out. The hospitality of Mr. Robert Angus, of Messrs. William Baird and Co., was perhaps the more graceful in that it was quite spontaneously offered, as soon as he heard of the projected meeting and its object. Mr. Angus is only very indirectly connected with the gas industry, despite the many million cubic feet of gas made in his works daily and his 90-inch gas-mains. The speeches after lunch were worthy of the occasion, and this is no mean praise.



THE WILLIAM MURDOCH MEMORIAL TABLET AT LUGAR.

Mr. Hislop's appreciation contained references to most of the outstanding events in Murdoch's career, couched in excellent language from beginning to end. Mr. Allen spoke in that easy style for which he is well known, with apparently no effort, but expressing his meaning with just the right word in the right place. Mr. Newbigging, having referred to the artist's successful efforts in the production of the tablet, proceeded to add his quota to the appreciation of the man, whose great genius had called the large company together to honour his memory. That his words would be concerned with the poetic side of his subject was to be expected; and his hearers were not disappointed. The meeting broke up early, owing to the awkward times of the trains; but one and all agreed that the occasion had been fittingly honoured, and another tribute paid to a great man. It is only right that honour should be done to those who have laid the world under a debt to them; but it is doubly so when, as in this instance, the inventor of gas lighting received no benefit from his genius. To Mr. J. W. Napier, of Alloa, are due the thanks of all for the very efficient arrangements he had made for the meeting.

The pilgrimage on Saturday of so many representatives of the gas profession to the birthplace of William Murdoch, and the dedication of a memorial bronze panel to his memory, shows that fit honour is at last being offered to the inventor of lighting by gas. Lugar, where Murdoch was born in 1754, is a secluded, if not hidden, spot that is scarcely disturbed by the great factory which centralizes all its energy. It lies about one-and-a-half hours' train journey from Glasgow, is on the main road; and now that the situation of Murdoch's natal house which it contains is known to all, those who have any historic interest in the evolution of the gas industry, and any reverence for its life-spring, cannot afford to leave it long unvisited.

Carried out under the auspices of the North British Association of Gas Managers, and admirably organized by Mr. J. W. Napier, of Alloa, the ceremony constituted a fitting tribute; and it should point the way to the institution of other, and even greater, memorials to one who revolutionized the social and the industrial life of the world. There was a gathering of about sixty gentlemen in the house at Bello Mill, the inventor's birthplace, when the function of unveiling the fine medallion took place. The work of the artist, H. S. Gamley, A.R.S.A., proved to be signally beautiful and full of character—as will be seen from the photographic reproduction—and it will henceforth show to the public a face peculiarly full of the inventive genius and fine mental initiative that lay behind it. Among the apologies for absence, was a letter from Mr. Charles Hunt, who wrote: "I am very glad that the North British Association has taken this matter in hand, for it has long been a standing reproach to the gas industry that no memorial to Murdoch existed at his birthplace. I may, indeed, almost lay claim to having discovered this. At all events, it was but little known before my very interesting visit about thirteen years ago."

On the call of Mr. J. M'Leod, of Greenock, the President of the North British Association of Gas Managers, Mr. G. R. Hislop, of Paisley, drew the veil from the bronze memorial. He said:

I greatly appreciate the honour you have conferred upon me in asking me to unveil this memorial tablet to our distinguished countryman, William Murdoch, to-day. I feel assured that the admirably executed representation of Murdoch, by the artist, H. S. Gamley, A.R.S.A., will leave an impression upon your minds that will never fade; and it is a great privilege and happiness to me to expose to your view the face of the man whose name and fame can never die. By this memorial, we once more place upon record our appreciation of the man whose life and work are important factors in the history of our nation and of the world. William Murdoch, the inventor of gas lighting, was born here on Aug. 21, 1754, and closed his eventful life on Nov. 15, 1839, at the age of 85 years, and was buried in Handsworth Churchyard, Birmingham, near the remains of his old friends Boulton and Watt,

HOUSE AT BELLO MILL, LUGAR—THE BIRTHPLACE OF WILLIAM MURDOCH.

with whom he was for many years associated while perfecting gas lighting, and revolutionizing mechanical science and the industrial and social life of the world. It is needless to say that Murdoch is entitled to a much more substantial erection to his memory than this or anything that the means of the North British Association of Gas Managers could command; but what we now contribute is with a deep sense of our indebtedness as a profession to one of the cleverest and most distinguished inventors and engineers that ever lived. We meet here to-day to set up this memorial tablet to his memory, in his own native place, and in the wall of the house in which he was born, that it may tell to the generations following that that genius was born here.

The Luncheon.

After the ceremony, the company were, on the invitation of Mr. Robert Angus (Messrs. William Baird and Co.), of Ladykirk, entertained at luncheon in the Lugar Institute. Mr. M'Leod, who occupied the chair, called upon Mr. Hislop to deliver

AN APPRECIATION OF THE LIFE AND WORK OF WILLIAM MURDOCH, THE INVENTOR OF GAS LIGHTING.

By Geo. R. Hislop, of Paisley.

I am here to-day upon your kind invitation to submit to you an appreciation of the life and work of our distinguished countryman, William Murdoch, the inventor of gas lighting; and I fear that even though the inspiration of meeting on his native soil should influence my heart and speech, I shall completely fail in doing adequate justice to his memory, and especially within the limited time available. And need I say that the memorial which we have unveiled to-day is but a small and comparatively insignificant tribute to the memory of the man whose life and work demand the highest place of honour in the history and the monumental tributes to our country?

In the good providence of God, it has fallen to certain chosen men in the past history of the world to discover and utilize the forces of Nature in accordance with the Divine purpose for the uses of mankind; and thus Murdoch comes upon the scene to tell the world that the store of carbonaceous matter formed and preserved by the Great Author of all could be utilized for the purposes of human life, in providing light as well as heat and power. And while the value of Murdoch's life and work, even as the inventor of gas lighting only, must appeal to every civilized man and woman in the world, it more especially appeals to us and all gas engineers and managers who owe our profession to him, and who are engaged in applying the principles of his invention to the domestic and public services of mankind. But scarcely less indebted to Murdoch are mechanical engineers and scientists, for his inventive ingenuity and incomparable skill as a mechanician, and for his knowledge of the forces of Nature.

I may compare Murdoch to a ball of radium in a diamond setting, as fittingly representing him in his mental and physical composition—a warm-hearted soul, with a brilliant intellect and an ideal personality, and who by invention and discovery has converted night into day, and made social and industrial life a joy to all civilized people upon the face of the earth. But notwithstanding all this, Murdoch was an exceedingly modest man; and had he on the contrary been a keener man of the world, he would not only have been rich, but, in the language of Job, his name and renown would have been "graven as with an iron pen and lead in the Rock for ever." But bowing to the will of his employers, who, through jealousy or misconception, prevented him from patenting his invention of gas lighting at the proper time, other unscrupulous and zealous adventurers were allowed to appropriate the product of his brain, and take the credit and honour, which alone belonged to him.

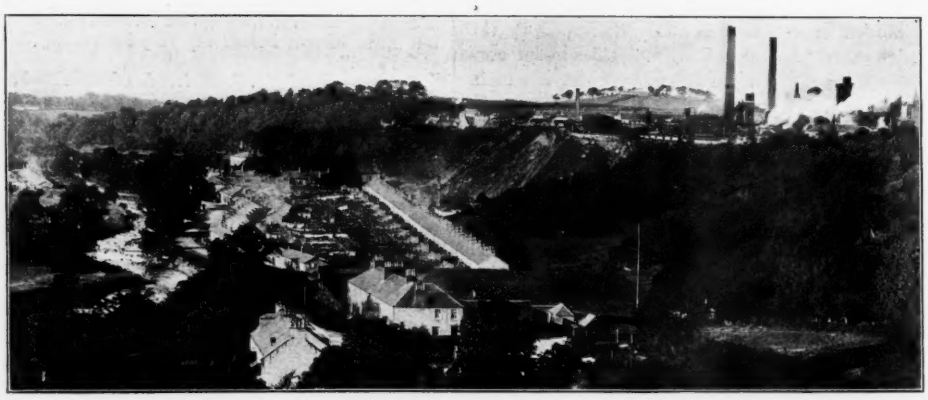
It was by indomitable perseverance that Murdoch achieved his great distinction as an engineer and inventor. Possessing a mind of great receptibility, he was ever ready to perceive the possible and adapt means to ends, or by a synthetical combination of natural laws and forces produce the mechanical equivalent that was in accordance with his ideals; and thus he would produce a model of the planetary system, perfect a steam-engine, or utilize the elastic force of air in producing vacuum or pressure and doing useful work. He was endued with the spirit of research into the hidden operations of natural law—an exercise which was the joy of his heart. He lived in an atmosphere of scientific truth which gave tone and vitality to mind and body, and enabled him to soar above his fellows in the higher planes of philosophic truth, and secured to him a knowledge of the natural forces, with their mechanical equivalents and possibilities.

The word "defeat" had no place in his vocabulary. His difficulties and reverses were but incentives to more energetic action. His industrial life was governed by his steady and persevering habits. Longfellow well pictures his life in the following lines:—

> "Let us then be up and doing,
> With a heart for every fate,
> Still achieving, still pursuing,
> Learn to labour and to wait."

As Robert Burns, our National Poet, an Ayrshire man, too, and contemporary of Murdoch, had his place in poetry and song, and filled a niche in human history which no one has ever rivalled, so Murdoch filled a niche upon the plane of human physical needs, social and industrial, in which no one has ever excelled, if at all equalled, so that his name and fame should endure so long as coal itself is known and gas is burned.

Murdoch may not have been the first to discover that coal gas could be burned, but he was the first to scrub and purify it, and distribute it in pipes. It is surely matter for regret, therefore, that so little has been done to perpetuate the memory and express the gratitude of our nation for a national service. Proposals have no doubt been made to erect a national memorial; but these have



THE VILLAGE OF LUGAR, WITH THE LUGAR IRON-WORKS ON THE HIGH GROUND TO THE RIGHT.

never come to fruition. But to the credit of the North British Association of Gas Managers, they, in 1892, placed a bust of Murdoch in the Wallace Monument, at Stirling, and subsequently in 1896 gifted a 9-H.P. gas-engine, inscribed to his memory, to the Engineering Department of the Glasgow University, for the generation of electricity—gas being the parent, and electricity the offspring. We once more meet to-day to pay another tribute to his memory, and upon the favoured spot where he first opened his eyes upon the world in which he was destined to fulfil his noble mission; and he claims our gratitude, not only as the inventor of gas lighting, but as a great inventor in other departments of human industry.

William Murdoch was born here on the 21st of August, 1754. Very little is recorded of him in his boyish days, beyond the fact that when not at school he herded his father's cows, on the banks of the Bello, and it is said dug out the cave in the rock on the river bank in which he afterwards made his experiments on gas lighting. When a boy at school, he and his brothers made a wooden horse, which anticipated the modern tricycle, and rode on it to and from Old Cumnock; and when only twenty years old, he is accredited with having built over the River Nith a substantial stone bridge, which is still in existence.

The Murdochs descended from far up the stream of noble ancestors; and it fell to William in no small measure to harness the resources of Nature for the uses of mankind. His father, too, was a noble man and inventor—a millwright, miller, and farmer combined, at Bello Mill here—and among other things he invented the toothed wheel and pinion gearing. Under him young Murdoch worked till he was in his twenty-third year, by which time he had been learning with absorbing interest of Watt's invention

ENTRANCE TO THE CAVE WHERE MURDOCH BURNED CANNEL COAL—SITUATED IMMEDIATELY BELOW THE HOUSE AT BELLO MILL.

THE INSIDE OF THE CAVE WHERE COAL GAS WAS FIRST MADE.

of the steam-engine, at the Soho Works, Birmingham. He resolved that he must get there, and into those works if possible, where he would find a wider outlet and application for his pent-up energies than his father's mills and workshop could afford him. So he set out for Birmingham in the year 1777, and duly arrived at the Soho Works, wearing, we are told, an oval turned wooden hat, which served as a certificate of competency and an introduction to Boulton (of Boulton and Watt), whom he duly met. As an indication of an active brain, Murdoch, while relating his experience and qualifications, kept twirling his hat in his hands; and he let it slip. Falling upon the floor, the unusual sound of it attracted the attention of Boulton, who wished to know what it was made of. Murdoch replied: "Timmer, Sir. I made it myself, Sir, in a bit laithey of my own contrivin." This was probably the first lathe ever made to turn an oval, as well as a round.

Watt, who had been at Cornwall looking after pumping engines at the mines, returned on the following day, when Murdoch was to return to meet him also; and then again the wooden hat certificate proved effectual, and secured for Murdoch an appointment at 15s. per week. The partnership of Boulton and Watt had at this time been in existence about three years only. Murdoch's capacity as a skilled mechanic rapidly manifested itself to his employers; and within two years (or in 1779), and at the age of 25, he was entrusted with the principal management of the works, at 20s. per week. He applied himself day and night—awake and asleep—on the steam-engine problem; and it is told of him that

in his lodgings one night the inmates were aroused by a thumping noise, and traced it to Murdoch's room. They found him pulling at the bed-post, and calling out: "Now she goes, lads. Now she goes." Murdoch was a great favourite among the mine owners, as well as all employed in the Soho works; but down to 1780 he was paid the paltry wage of 20s. per week. In that year, Boulton and Watt made him a present of £10, and the mine owners also gave a like sum, as an acknowledgment of his invaluable services to them under numerous difficulties.

Murdoch in 1781, when in Cornwall, invented and patented the sun-and-planet motion, as a substitute for the crank rotary motion (which had previously been patented), and which has found many applications in mechanics. In the same year he invented a model of the locomotive engine, fitted with copper boiler and spirit lamp; and in 1784 he made it haul model waggons round the room, and subsequently upon the street. It was looked upon as the embodiment of the evil one. His firm became jealous of his success, and afraid of the invention running away with his brains and diverting his attention from his other important duties. They, however, offered him £100 should he succeed in producing, within a year, a chaise to carry two persons four miles an hour, and a load of 200 lbs., with fuel for four hours and water for two hours; but having regard to the feelings of Watt, the project was dropped. So that, but for the opposition of Watt, Murdoch would have had a serviceable locomotive running on rails fifty years in advance of Stephenson's time. It was about this period (1785) that Murdoch married Miss Ann Paynter, daughter of one of the mine captains; but she died in 1790, leaving two sons, William and John.

Murdoch's first attempt to make gas was in one of his mother's old iron teapots; and some time later he distilled coal in an iron kettle, and led the gas through pipes taken through the window. He fixed on the pipe a thimble with a few perforations in the end of it—thus producing a star light; and in 1794 he suggested to James Watt, junior, the propriety of taking out a patent for his system of gas lighting. But this was not favoured by Watt, senior, as he was at the time engaged in a law suit over the condensing engine. Murdoch was much vexed by the obstacles continually thrown in his way; and becoming disgusted with repeated discouragements, he resolved to free himself from his bondage as a servant and devote his time and talents to his own inventions. He returned, it is said, in 1797 to Old Cumnock, and started a foundry, and continued his experiments upon gas lighting, and lighted his foundry; and this was the first practical gas lighting installation in Scotland. A year later, the mine owners in Cornwall offered him £500 a year, as their Chief Engineer; but this he did not care to accept. Boulton and Watt, however, found that Murdoch was an indispensable man in the conduct of their business, and so recalled him after an interval of a year to manage their works, at £1000 a year. In the following year (1799), he invented the endless screw and toothed wheel for boring steam cylinders, and also the casting of steam jackets in one cylinder piece instead of in parts, then the double D slide-valve, so simplifying the working of the steam-engine, and about the same year also the rotary steam-engine.

In 1801, M. Lebon planned the lighting of some of the streets in Paris. Murdoch, hearing of this, pursued his experiments in lighting; and in 1802, in order to celebrate the Peace of Amiens, he made his first public exhibition by lighting the Soho Works in Birmingham with gas, which produced a very great impression. In the following year (1803) the manufacture of gas-making plant was added to the business of Boulton and Watt; and with an additional capital of £4000 to £5000, gas lighting now made rapid progress. But Sir Humphrey Davy ridiculed the idea of storing and delivering gas through pipes, and asked the promoters of a Bill to light a part of London if they would make the dome of St. Paul's a gasometer. Sir Walter Scott also joked about sending light through pipes to light the streets; and Wollaston said, "You may as well attempt to light London with a slice off the moon." We thus see that the cleverest men of that period considered lighting by gas an impossibility. Murdoch all the while was in possession of the absolute facts of experimental science in regard to it, and was in the proud position of confounding the incredulity, ignorance, and prejudice of these distinguished men of science and letters.

In 1808, Murdoch prepared a paper on the application of gas from coal to economical purposes; and it was read before the Royal Society, by Sir Joseph Banks, the then President. For this he was awarded the Rumford gold medal, which probably was the only tangible reward he ever received for gas lighting. In 1809, Winsor, a German, attempted to get a Royal Charter for lighting part of London. This was opposed by Boulton and Watt. The project was treated as absurd, people believing it impossible to get a light without a wick.

In the following year, however (1810), the Chartered Gas Company, now the Gaslight and Coke Company, obtained an Act, and on the proposal to light the House of Commons, the Architect, supposing the gas to be on fire in the pipes, would have them embedded in the walls; and when the pipes were fixed the members of the House would only touch them with gloves on, so great was their ignorance and incredulity. This was so general that the Company was on the point of collapse when Samuel Clegg, who had been a pupil of Murdoch at Soho, came to the rescue, and made the venture a success. This was in 1813; and in 1814 Westminster was lighted, and following this St. Margaret's. It is related that, so great was the prejudice against, and dread of, the new light, that Clegg had for a time to light the lamps himself. Liverpool followed in 1816, and the next year Glasgow, and Dublin in 1818; Birmingham not doing so until 1826. What a glorious triumph for the ingenuity and skill of Murdoch, but what a reflection on lost opportunity and vanished hope in not reaping the reward so well earned, now that lighting by gas was a fact no longer to be doubted by the learned and ignorant alike!

The failure to patent his valuable invention left him nothing but the honour of it. Murdoch now could only try to forget his misfortunes, and so devoted his energies almost completely to the interests of Boulton and Watt, to whom he assigned all his patents for a substantial consideration. Indeed, everything in the Soho Works was either partly or wholly the product of his brain. He was made a partner of the firm in 1800, and retired from it in 1830, at the age of 76 years. Watt had retired in 1800, when his son succeeded him, and when Murdoch was made a partner. Boulton died in 1809, and Watt in 1819, in his 83rd year. Murdoch himself died in 1839, at the age of 85 years, and was buried in Handsworth Churchyard, near by his old friends Boulton and Watt; so that in death they were not divided. A very fine tablet has been erected to Murdoch's memory, and his two sons, William and John, in Handsworth Church. The son William died in 1851, aged 44; and John in 1862, aged 72.

Murdoch's inventions are almost too numerous to mention here; but in addition to gas lighting, I give the following, but incomplete, summary: He invented the first locomotive engine and high-pressure engine; the oscillating engine cylinder and the rotary engine; the double D slide-valve and connecting-rod, toothed wheel gearing; the boring of steam and water pipes; air pressure and vacuum tubes for lifting castings and working hoists, ringing bells, blowing furnaces, and the atmospheric railway; the endless screw and toothed wheel for boring steam cylinders; casting steam jackets in one cylinder, instead of in pieces, and bolting them together; the sun-and-planet motions; the circulation of hot water for domestic purposes; a cast-iron cement; a paint for protecting ships' bottoms; and a substitute for isinglass from fish skins, for which he received £2000. He also made alloys of gold, silver, and iron, and even aniline, and some of the coal tar dyes, and several other inventions besides.

It will thus be seen that we are indebted to Murdoch for many of the mechanical, chemical, and philosophical devices in universal application to-day; and need I say therefore that it is impossible to study the life of this ingenious man without expressing our highest admiration of him for his remarkable ingenuity? His life affords a splendid example and an inspiration to all young men for self-reliance, perseverance, and not-stop mental and physical effort in the attainment of eminence and distinction, since he rose till he became associated with the leading scientists and men in the highest social position in his time, and he has left the world a heritage which all the monuments our nation could erect to his memory could never compensate.

Gentlemen, we should be happy that we were born to be disciples of this noble man; and I feel certain that none of us ever questions his high ideals, but, on the contrary, we endeavour to honour his name in furthering what was to him one of the most absorbing inventions of his life, and which has revolutionized social as well as industrial life throughout the world. We here assembled to-day anew commit and commend the name and fame of William Murdoch to the consideration and justice of the British nation, that it may erect and inscribe a suitable monument to his memory, expressing the nation's gratitude for a national service.

Mr. Joseph Hepworth (Edinburgh), in proposing success to the gas industry, said as he was coming through from Glasgow that day he could not help thinking of the two or three great outstanding names he always associated with Ayrshire. Burns had never been too much honoured; but how many of those who passed that way ever thought of the name of Murdoch? He was glad, therefore, that something had been done by the North British Association of Gas Managers to perpetuate the memory of one who deserved all the honour that they and others could confer upon him. He thought there was room, not only in the gas industry but also among mechanical engineers, to honour the name and fame of Murdoch. Their Chairman had pointed out his noble doings and his great success in what he put his hand to in mechanical engineering; and he (Mr. Hepworth) trusted the day was coming when the mechanical engineers of this country would realize their debt to Murdoch. How little did the men who lived in Murdoch's time know of how great an industry the gas industry would become, the millions of money that would be invested in the industry, and the great armies that would be engaged in it! They had, of course, opposed to gas electricity; but, notwithstanding the competition, the gas industry was just as likely to flourish as ever it was before. With the toast of "The Gas Industry and Allied Trades and Industries," he coupled the name of one who was honoured in every country—Mr. Allen, the President of the Institution of Gas Engineers.

Mr. Allen expressed his thanks for the opportunity of being present on so memorable an occasion, and said he was glad to represent the Institution of Gas Engineers and the allied organization of the British Commercial Gas Association, in which, as they knew, the commercial interests of the great industry were dealt with apart from the technical division. He would almost say that he represented the Society of British Gas Industries. Certainly, in spirit, he did; for it was not unknown that he took a leading part in the work of the Institution at present in the joining together, as speedily as possible, of the various and varied interests which were under their consideration, and which he hoped would soon be accomplished. When one thought of the first gas engineer who in his small way perfected the carbonization of coal for the manufacture of gas—not so many years ago, after all—and when one thought of the benefits derived by the mechanical invention of William Murdoch, one was appalled, and could not realize the greatness of the blessing to mankind. They read of burning the midnight oil;

and when they thought of the poor student of old sitting in his room and studying, they could not help feeling what a pity it was that he had not had the blessing of gas which students of to-day had through the invention of William Murdoch. He could not attempt to describe the greatness of the industry so well represented there by the North British Association of Gas Managers; but he might be allowed to say how very much the Council of the Institution of Gas Engineers were interested in the District Associations. Of course, they looked upon the North British Association with a great amount of reverence, because it was older than the Institution; but they had placed the Institution in the senior position, and they desired to do their duty by the Association and by the other Associations in the country. He never knew a time when institutions and associations were so vigorous as at the present day; and they might all look with great pleasure and hopefulness on the Junior Associations of the country. He had been at Birmingham in the spring at the meeting of the Midland Juniors. He listened to the speeches of the young men; and when he looked round the large body assembled, he felt that their industry was safe, that the young men had the right spirit, and that the coming generations of gas engineers would do as well as their predecessors had done in the past. He admitted that there were giants in those days; but even at the present time they had Mr. Thomas Newbigging, whom they called the "Grand Old Man" of their industry.

Mr. NEWBIGGING remarked that he was glad they were doing this service to the memory of this other great Ayrshire man, this countryman, this neighbour and contemporary of Burns, who, in his own way—his own immediate way—as did the poet, took his place in the march of human affairs. Both were endowed by Nature with that Heaven-sent gift—one of the greatest—the gift of imagination; the one as a poet, the other as an inventor. To be the inventor of the art and practice of gas lighting was achievement enough for the fame of any man—an art which had been of incalculable blessing during the more than century of its existence. And Murdoch was not only this; he applied his genius in other directions, among the rest the application to Watt's steam-engine of such adjuncts as redeemed its uncertain action and made it a perfect working instrument. He need not, before his present audience, refer in any detail to the great utility of Murdoch's invention, with which they, as gas engineers, were mainly concerned, and the potent influence for good it had been during the growing years of its application. But it was not out of place to say that there never was a time when more activity was displayed in every department of gas enterprise than now. It was almost bewildering in variety and extent. They need only look at the Technical Press for proof of this. Their friends and forerunners of (say) fifty years ago, who had long since paid the debt of Nature, if they could "revisit the glimpses of the moon," would look with amazement on the progress that had been made in the interval both in the appliances and the processes of gas manufacture and supply. He saw no end to this progress. In his opinion, so long as the supply of coal lasted, the progress was assured; and when the supply of coal gave out, the gas industry would not be the only sufferer. There would be many brothers in misfortune when that time arrived. All this, however, was in the dim and distant future; and it need not greatly trouble them to-day. Meanwhile, let them—especially their young engineers, who were the heirs of such an ample legacy—aspire to, and gain, the laurels that were still to be won in the practice of their profession. There was a bright future before them, if only they were true to themselves and their work. The standard of ability among the members, it was pleasant to know, had kept pace with the progress of the industry. At no previous time had so much genuine ability been brought to bear on the investigation of the varied and difficult problems with which gas engineers were still confronted. In view of this fact, gas committees, gas directors, and gas shareholders should be loyal to their managers; and ready to recognize and to adequately recompense ability and assiduity—which was not always the case, though it was a policy that paid. A word to the wise was sufficient. He had mentioned the Technical Press. They should never overlook how much they were indebted to that Press. He often thought that they did not recognize the debt as fully as they ought to do; certainly not to the extent which the merits of their friends of the Press deserved. Like the air they breathed, they took all the fruits of their labour as a matter of course. But how if, by any catastrophe, they were deprived of either the native air or the mental and spiritual air they breathed! What then? He must not, however, trespass upon their time. If he were asked to name the distinguishing quality of William Murdoch—after his ingenuity and resource as an engineer—it would be the innate modesty of the man. It shone in every lineament of his pleasant face, and, like a magnet, attracted their affection, as did his great abilities their admiration. It was well to remember the man in Lugar, the place of birth. He thanked them heartily for giving him the opportunity of joining them on so happy an occasion.

Mr. J. W. NAPIER proposed the toast of their host, Mr. Robert Angus, who had placed them under a deep debt of gratitude. They all recognized in Mr. Newbigging, with his 55 years' experience, the venerable patriarch of the gas industry, and a man whose name had been written large on the pages of literature, and in the matter of poetry as well. When he observed Mr. Allen, with close upon 50 years' experience, he thought they would agree with him that the youth of the industry must take a minor place. In Mr. Angus they had also another example of a man, with a fine record over the long period of 56 years, who had exercised a very important influence upon the iron industry in Scotland. He had been connected for more than half-a-century with one particular firm; and his record was not only unique, but, he was sure, very interesting.

Mr. ANGUS replied in a speech of great humour; and Mr. ALEXANDER WILSON, of Glasgow, paid a graceful compliment to Mr. M'Leod, the Chairman. All the company, he said, were greatly indebted to Mr. Napier for the successful organization of the day's proceedings.

The party then broke up.

Mr. Daniel Hill, one of the Directors of the Watford Gas Company, who died at the age of sixty-nine, left estate of the gross value of £30,683.

GAS-WORKS AND MOTOR FUEL SUPPLY.

At the Imperial Motor Transport Conference held at Olympia last week, in connection with the exhibition of industrial motor vehicles, two papers were submitted in which the question of the supply of motor fuel was dealt with. One was the combined production of Sir BOVERTON REDWOOD, Bart., and Professor VIVIAN B. LEWES, F.I.C., F.C.S., and the other by Mr. W. J. A. BUTTERFIELD, M.A., F.I.C. We give the portions of these communications which are of special interest to "JOURNAL" readers.

PETROL SUBSTITUTES FOR USE IN MOTORS.

This was the title of the paper by Sir Boverton Redwood and Professor Lewes. The authors began by remarking that the present high price of petrol, and the apprehension of increasing scarcity, with even higher resulting cost, had naturally directed attention to the question of possible substitutes obtainable in adequate quantity at moderate cost. They thought the only sources from which these were likely to be obtained were: (1) Those portions of crude petroleum other than the petrol fraction; (2) products of the destructive distillation of coal and shale; and (3) products of fermentation. These they considered in detail. They pointed out that a process which occupies a position of importance is that which is termed the "cracking" of oil. If a hydrocarbon is heated to a high temperature, it is broken up into carbon and hydrogen; but if the temperature is so controlled as to prevent complete decomposition, the hydrocarbon is not broken, but cracked into lighter hydrocarbons.

UTILIZATION OF TAR.

The authors said the idea of cracking had been extended during the past few months from heavy hydrocarbon oils to the distillates obtained from coal. When coal was subjected to destructive distillation, it broke up into gases, tar, and ammoniacal liquor, which were volatilized and left behind a residue of coke. The tar so produced varied widely in its character with the temperature at which the carbonization had been carried on, the nature and condition of the coal, the form of retort, and other factors. It could be classified under two broad headings: (1) Tar, the bulk of which had been distilled at temperatures above 800° C.; and (2) tar, of which the bulk had been distilled below this temperature. Class 1 included the tar made in horizontal and inclined retorts during ordinary gas-works practice; while Class 2 consisted of the tars made in vertical and chamber retorts and low-temperature processes.

The higher-temperature tar was "benzenoid" in its character, and contained as its chief constituents benzene, toluene, carbolic and cresylic acids, naphthalene, and anthracene, together with pitch containing much free carbon. All these hydrocarbons belonged to the ring form of structure, were high-temperature products, and, when sufficiently heated to decompose, broke up chiefly to methane, hydrogen, and carbon; so that this form of tar could not be cracked profitably. The only possible treatment for it for the production of motor spirit was to distil off the benzene and toluene, which were the valuable portions for this purpose, and then to take the oil fractions and distil them through a column of red-hot coke, when a small additional quantity of benzene and toluene was formed by the decomposition of the carbolic and cresylic acids in contact with the carbon surface. The cost of doing this, however, would be prohibitive; and only the fractions distilling from the tar direct could be reckoned upon. Though something like 15 million tons of coal were carbonized annually for gas making in this country, it was only the largest works that distilled their tar; and the quantity available for motor spirit would be only about 50,000 gallons per annum.

With vertical retorts, a large percentage of the tar was distilled at a lower temperature, and became more paraffinoid in character—a slightly larger fraction being fitted for motor spirit. But at present such tars were generally mixed with those from horizontal retorts, and were not available for separate distillation. Coke-oven tar was also of this character; and by scrubbing the gas with heavy oil to wash out the benzene vapour and distilling the tar, as much as 3 gallons of distillate fitted for use as motor spirit could be obtained per ton of coal.

True low-temperature tars of the character yielded by destructive distillation below 500° C. were even more paraffinoid in their character; and several processes had been brought forward lately for which it was claimed that about 3 gallons of motor spirit could be obtained by direct distillation of the tar from a ton of coal, and a further 2 to 5 gallons by cracking the naphtha distillates from the tar. The latter claim was a somewhat doubtful one; but it had been seized upon by the advocates of such processes, who boldly spoke of 7 gallons of motor spirit per ton from any small coal. In considering such claims, however, it should be remembered that, though there might be a few coals in this country which, by careful treatment, fractionation of the tar, scrubbing of the gas, and cracking of the suitable distillates, might be made to yield this quantity, the cost of treatment probably outweighed the advantages.

DISTILLATION OF COAL AND SHALE.

At the present time there was no commercial process working on a large scale which would yield more than the 3 gallons per ton of

coal carbonized that could be obtained from coke-oven practice; and the total amount of benzene so recovered would amount to about 8 million gallons per annum, a large proportion of which was exported. Much might be done in the direction of replacing the beehive coking ovens, which still existed to a very large extent in the North of England, by recovery ovens; but, as matters at present stood, the amount of benzene available was so small that any large demand would cause it to rise in price even more rapidly than petrol had done.

The Scottish shale-oil industry was another source from which motor spirit might be obtained; but the 600,000 gallons which represented the annual output of distillates fitted for this purpose was only about 0·75 per cent. of the total petrol used last year, and a considerable proportion of it was marketed for solvent purposes. The heavier portions of the shale oil, however, lent themselves to cracking purposes; so that unless these fractions were all absorbed for fuel oil they might in the future prove a source of supply.

Alcohol as a Source of Power.

It must be borne in mind that any petrol substitutes made from petroleum, coal, or shale were obtainable in limited quantity, for in each case the store of raw material was in process of depletion. On the other hand, alcohol was a motor spirit which could be continuously manufactured in any required quantity; and if the conference only realized this fact, and used its influence in the first place to stimulate the designing of an engine and carburettor best fitted for use with this liquid, and, secondly, to induce the Government to give the necessary facilities for the manufacture and use of methylated spirit for the purpose, it would have done much towards giving this country a home-produced source of power of which no foreign entanglements could rob us.

SUPPLY OF HYDROCARBON MOTOR FUELS.

This was the title of Mr. Butterfield's paper. The author pointed out that the range of temperatures of volatilization or distillation of the several components of hydrocarbons was perhaps the most important factor in judging the fitness of a mixture of them for use as motor fuel; and this range did not depend on the series to which the hydrocarbons belonged. A commercial benzol might fractionate on distillation exactly as a standard grade of petrol. Hence all potential sources of supply of hydrocarbons of the requisite degree of volatility must be considered in this connection, irrespective of the series or class to which they belonged. The components of any motor spirit must, however, include only limited quantities of sulphur and nitrogen compounds, since these compounds yielded on combustion products which attacked or corroded steel and most metals, and were offensive in smell.

Having considered, in succession, petrol or motor spirit from petroleum, hydrocarbon motor spirit other than petrol, and shale oil motor spirit, Mr. Butterfield proceeded to make the following remarks.

Motor Spirit from Gas-Works and Coke-Ovens.

The British Dominions have, perhaps, more of the world's deposits of bituminous coal than correspond with their area. Hence schemes for the production of motor spirit from bituminous coal and cannel are of special interest in this connection. The carbonization of bituminous coal as carried out in coke-ovens and on gas-works at the present day yields gas and tar from which, by appropriate methods, from 1½ to 3 gallons of motor spirit, consisting chiefly of benzol, may be extracted per ton of coal carbonized. This yield would by itself be totally inadequate to pay for the cost of the handling and carbonization of the coal; but the return from recovered benzol should be an important factor in the works balance-sheet of coke-ovens and gas-works. At present, the gas produced on gas-works is not treated for the extraction of motor spirit; and if it were so treated the calorific value of the gas would be reduced by 6 or 7 per cent. The gas impoverished to this extent would have to be sold to the consumer at a correspondingly lower price; so that the proceeds from the recovery and sale of benzol would have to bring in a net return in excess of (say) 7 per cent. of the cost price of the gas made.

The amount of motor spirit recoverable from coal gas depends partly on the quality of the coal carbonized, and partly on the temperature and mode of carbonization; but where both of these are favourable to a yield of as much as 2½ to 3 gallons of motor spirit per ton of coal carbonized, there appears to be sufficient margin of profit and advantage to the larger gas undertakings and their consumers to warrant the recovery of motor spirit from town gas. In most cases, some fresh legislative authority would have to be sought and obtained before the change in quality of the gas which the recovery of motor spirit would entail could be made. On the other hand, there is very little obstacle, beyond the necessary capital expenditure on recovery plant, to the general extraction of motor spirit from coke-oven gas.

The words "motor spirit" have been used in preference to "benzol" in connection with coal gas, because it is unnecessary for fuel purposes that the motor spirit recovered should have the composition and characteristics of the commercial grades of benzol, and a restriction to these grades would in many cases appreciably reduce the yield of motor spirit per ton of coal. Generally speaking, however, the motor spirit recoverable from coke-oven gas and town gas would closely resemble commercial 50 per cent. benzol.

Motor Spirit from Coal Tar and Coal Oil.

The tar produced in the carbonization of coal on gas-works and in coke-ovens contains a relatively very small proportion of highly volatile constituents which could be utilized as motor spirit. The motor spirit recoverable from gas-works and coke-oven tar (as distinct from the motor spirit which may be extracted by special means from the gas) will not amount to more than 0·1 to 0·2 gallon per ton of coal carbonized. The remaining constituents —*i.e.*, tar oils, pitch, &c.— of ordinary coal tar, being themselves high-temperature products, do not yield by "cracking" any appreciable quantity of highly volatile oils which would serve as motor spirit.

Many schemes have been propounded for carbonizing coal in a manner which shall give a tar containing a much higher quantity of constituents of the nature of motor spirit. These schemes all depend on a lower temperature being used for carbonization than is adopted in the gas and coke industries, and differ one from the other chiefly in the provisions made for removing the tar and oil from the carbonizing vessel before they have had any prolonged contact with surfaces at a high temperature. Hence, in these schemes, cracking of the oil and tar vapours is as far as possible avoided, for the reason that, while in suitable conditions it should increase the yield of motor spirit, the carbonizing vessel presents very unsuitable conditions for such cracking.

The tar or oil obtainable by low-temperature carbonization from bituminous coal averages about 15 to 20 gallons per ton of coal; and from this ¾ to 1¼ gallons of motor spirit can be obtained by distillation. If the gas produced at a low temperature be stripped of its light hydrocarbon constituents, a further yield of 1½ to 2½ gallons of motor spirit may be expected—making a total yield of 2¼ to 3¾ gallons of motor spirit per ton of coal. But a large proportion of the heavier constituents of the oil or tar obtained by low-temperature carbonization can be cracked by the methods already referred to for the cracking of shale oils; and by these means a yield, direct and indirect, of 5½ to 7 gallons of motor spirit may be obtained from a ton of bituminous coal. Certain cannels will give a very much higher yield.

The commercial success of schemes for the low-temperature carbonization of coal depends, however, only to a limited extent on the possible returns from motor spirit. The semi-coke or smokeless fuel produced at the same time must have a market value per ton at the point of production not less than about 75 per cent. of the market value at the same spot of a ton of good quality large coal, while the plant for the low-temperature carbonization must admit of the coal and semi-coke being handled throughout by mechanical means; and the process and the coal carbonized must be such that a yield of not less than 25 lbs. of sulphate of ammonia per ton of coal is obtainable. It is only in conditions substantially such as those indicated that schemes for the production of motor spirit by the low-temperature carbonization of coal are likely to prove commercial successes.

As regards the quantities of motor spirit required, and the possible yields from certain sources, it has been estimated that about 100 million gallons of spirit are now being consumed in the United Kingdom alone in a year; and this quantity will increase rapidly for some time to come. The motor spirit recoverable from coal tar is trifling in quantity; and a large proportion of it is required as benzol in chemical industries. The extraction of benzol or motor spirit from all the coke-oven gas in the United Kingdom should give, on the basis of about 2 gallons per ton of coal coked, about 30 million gallons of spirit per annum. The stripping of coal gas in the larger gas-works alone should give a yield of about 30 million gallons per annum. The oil shale at present quarried in the United Kingdom—viz., about 3 million tons a year—should be capable, by suitable cracking of the crude shale oil, of yielding about 30 million gallons of motor spirit. The production of this motor spirit from the shale at present quarried would mean the diversion of the latter from its present purposes; but there seems no reason why, if the cracking processes proves economical when worked on a large scale, greatly increased quantities of oil shale should not be worked. The feasibility of obtaining supplies of motor spirit by the low-temperature carbonization of coal must depend entirely on the local values of coal, semi-coke, and sulphate of ammonia.

These figures for the United Kingdom might serve to assist in a study of the prospects of developing sources of motor spirit from natural resources in other parts of the Empire. Broadly speaking, coal can be regarded as a raw material for the production of motor spirit only to the extent to which local markets can be found for gas and gas coke, for metallurgical coke, or for semi-coke or smokeless fuel. For the further quantities required of motor spirit of a hydrocarbon nature, petroleum and oil shale must be depended upon. Where little demand exists for lamp oil, heavy fuel oil, lubricating oil, &c., the greater part of the crude petroleum or shale oil may be converted into motor spirit by recourse to appropriate methods of cracking.

The papers gave rise to a discussion, the general result of which was the passing of a resolution urging the development of alcohol as the motor fuel of the future.

Mr. Southey, however, moved the following resolution, which was ultimately rejected: "That this conference is of the opinion that an adequate supply of liquid fuel for motor transport can be obtained from coal-tar oil—a bye-product in the manufacture of partially coked fuel or bituminous coal suitable for use in open

grates." He said he was quite sure that the time had arrived when it was possible to utilize the heavy coal-tar oils, such as creosote, to drive high-speed internal-combustion engines. In America, much work had been done in this direction, and quite successful results had also been achieved in England, working on the same lines. The supply in this case was, for all practical purposes, unlimited; and it was also within the Empire. Our coal deposits were enormous compared with our oil deposits; and working in the direction he had indicated would also help to solve another problem—viz., that of smoke abatement. There was no reason why some system of partially coking the fuel should not be adopted by the coalowners, for as long as they put on the market a fuel that would give the householder a cheerful fire a very big demand should be immediately forthcoming, with the result that much less smoke would be emitted from domestic chimneys, and coal-tar oil for motor transport would at the same time be obtainable at a comparatively reasonable price.

Dr. LESSING, seconding the resolution, said it was impossible to consider the supply of motor fuel without taking a wider view of the fuel supply, both solid and liquid, in general. It had been stated by the Royal Commission on Fuel Supply that the coal burnt for steam purposes in the United Kingdom alone was something like 160 million tons a year. Another 36 to 40 million tons were consumed in the domestic grate. Everybody knew that the efficiency in both of these cases, and more especially in the latter, was a very low one indeed—in fact, it might be assumed that nearly all, or at any rate the greater part, of the liquid products derived from coal or heating was not utilized at all, or only to a very small extent, in the case of domestic heating in the open fire. It would be an enormous economic advantage if this part were to be split from the coal by suitable means, and a fuel left behind eminently more suitable, of higher calorific value, not containing any oxygen and but little hydrogen, and altogether more suitable than the raw coal, because the radiant effect of such a fuel would be higher, and would not be obscured by the smoke-producing parts which had to be distilled off before a proper fire could be obtained. If only 10 per cent. of the industrial fuel, or 15 per cent. of the domestic fuel, required in this country, or some composite figure of the two, could be treated in a way which had been brought to the knowledge of the public—or suggested, at any rate—frequently of late, sufficient liquid products could be obtained to account practically for the whole requirements that were necessary. One other way out of the difficulty might be if the Navy would adopt some such fuel in the place of the steam coal which was the solid fuel at present exclusively used. This would at once, and practically at one stroke, get rid of the difficulty of disposing of the solid residue. That a solid residue of coke, or semi-coke, could be obtained in the very near future, and of a quality good enough for their purposes, there could be little doubt; and on doing so, and (say) coking 5 million tons of coal, there would be sufficient tar produced to allow of a large portion of the light motor spirit consumption in this country to be satisfied, and to leave practically all the 200,000 tons of liquid fuel which Mr. Churchill stated was required for the Navy last year. There was good reason for believing that the lighter spirit out of the liquid portion could be increased. The problems put forward by Sir Boverton Redwood with regard to petroleum applied also to tar oils. The "cracking" could be done, though it was not quite so easy as with the ordinary petroleum products; but so far it had been only a very crude and rule-of-thumb process. We were only on the fringe of discoveries and inventions which would show that scientific principles could be applied to this process of disintegrating the higher molecules, letting it work in definite directions in order to obtain definite products. All this applied to the motor spirit only; but there was no doubt that so far attention had been concentrated too much on the one principle of the carburettor in motor traction. Many of those present possibly had seen appliances which consumed the higher oils—he was alluding to the question of gas production from oil in a very small compass close to the engine. Heavy oils could by this means be gasified and partly vaporized, and would yield a very suitable gas for ordinary road work. Attempts formerly had been always to apply the ordinary carburettor principle to these high oils, with the effect that the high-temperature carburettors had to be so constructed that the compression in the cylinder condensed a good deal of the vaporized oil, and difficulties arose through flooding the cylinders and sooting-up the sparking plugs, and so on. With the new principle, these difficulties were practically done away with. A clean, permanent gas could be produced, carrying just as much vaporized oil as the heat generated in the producer during the partial combustion of the gas produced would vaporize. By the application of such a method, a further step was made towards the solution of the problem of the supply of motor fuel, because a much larger proportion of the heavier oils would be available for the purposes of motor traction.

No other speaker dealt with this aspect of the question.

Professor LEWES, however, had something to say about it in replying to the discussion. He said he was not so optimistic with regard to coal as he ought to be, perhaps because he had had more experience on these lines than anybody else. He had had to go into it in connection with an ill-fated scheme which was very much to the fore three or four years ago—a scheme known as "Coalite," for which he gave a great deal of advice which was never taken. In this, coal was distilled at low temperatures in order to give a smokeless fuel; and he would say at once that it was the very finest scheme ever brought forward. It was one which was bound to come. It was a scheme upon which depended the cleansing of the atmosphere of our big towns and the proper utilization of the various products obtained from coal; but it was absolutely muddled and frittered away. Nevertheless, he had the experience of seeing, while the scheme was in operation, a good many million tons of coal distilled at low temperatures in order to obtain the various products; and one of the very first things that was started to be done was to make a motor spirit called "Coalene," which worked excellently well. About 1½ gallons of spirit were obtained from each ton of coal, and more by scrubbing the gas, though the quantity was not large. It seemed to him that the great point in discussing the question of obtaining motor spirit from coal-tar products was that the "cracking" of the tar was a little fallacious under these conditions. The quantity of oil to be so obtained was not large, having regard to the nature of the demand; and it involved a great deal of trouble and expense. It was for this reason that coal-tar products must, in his opinion, be looked to as a very doubtful source. With regard to the idea of scrubbing coal gas to get benzene out of it, the suggestion of this would meet with opposition from all the gas makers in the country. The gas industry here was composed of some of the best business men in the world; and if any people thought they were going to "rush" them in two years, or in twenty years, into giving up something which might be worth a penny or a halfpenny or anything else, on the price of gas, they were very much mistaken. It was this same hard-headed commercialism which was responsible for so little motor fuel from coke-ovens being available. At present, not quite one-half of the coal in this country was coked; and it might be asked why plants were not put up to deal with the other half. The chief reason was that it was in the North of England, where the Durham and Yorkshire and Lancashire coals were not at all well suited for recovery plants. So it was left to Germans to come over here and set up plants and pay for the privilege of taking away the bye-products, with the result that all the benzol so obtained was booked for Germany, or elsewhere abroad. Benzol being limited in quantity, directly there was any demand for it, the price began to go up. Twenty years ago, when it was required for the aniline dye industry, and fetched 15s. a gallon, it did not pay to scrub the gas for it; and if it did not pay at that price, it could hardly be expected to pay to-day, in spite of the fact that the price had gone up from 1s. to 1s. 6d. per gallon in quite a short time. It was for these reasons he maintained that the motor industry must look to alcohol as its future fuel.

AMMONIA AND NITRIC ACID IN BUNSEN FLAMES.

The subject of the formation of ammonia and nitric acid in the flame of the bunsen burner is dealt with in the "Revue Générale des Sciences" for the 15th inst. It is remarked that at the present time, when the problem of the synthetic preparation of nitrogen derivatives is being carefully studied, it is rather interesting to note that this synthesis is produced in the flame of bunsen burners. This at least is the idea lately supported by M. Nagibin at a meeting of the Chemical Section of the Moscow Society for the Promotion of Science. When the flame of a bunsen burner is directed on to a large glass flask in which there is a circulation of cold water, drops of condensed water form on the sides after a few minutes. With the sulphuric acid and diphenylamine reagent, this water gives a deep blue colour. Moreover, when the experiment is continued for some time, viscous drops form on the glass which congeal in cooling, and in which sulphate of ammonia can be detected. Moscow gas only contains quite negligible traces of ammonia; and it is certainly not to their existence that the formation of the sulphate is due—sulphuric acid originating naturally in the sulphuretted hydrogen existing in the gas. Besides, the ammonia and nitric acid in the condensed water are not produced in mere traces, but in appreciable quantity—the ratio between the weight of ammonia and that of nitric acid depending upon the volume of air utilized for the combustion of the gas.

Industrial Lighting.—At the close of an article on "Industrial Lighting" in "Industrial Engineering," Mr. E. Leavenworth Elliott said: "There are no respects in which daylight may not be equalled by artificial light, and some in which it may be excelled. The rules for accomplishing this are, furthermore, extremely simple. First, have enough light; second, have it completely diffused, with the light sources themselves hidden; third, provide special light where colours must be seen by their daylight value. Or, to condense all of these into a single direction: Fill your whole factory full of light, just as Nature does, and your lighting problem will be solved."

Proposed Use of Water Gas in Paris.—An important report has been presented to the Paris Municipal Council by M. Louis Dausset, the Budget reporter, with the object of obtaining for the Paris Gas Company authority to manufacture and distribute water gas, which, under the terms of their concession, they are not allowed to do. The attention of the Council was called, towards the close of last year, to the necessity of taking advantage of all useful changes in the raw materials of gas manufacture and in the methods of using them, in order to meet the increasing expense of working the undertaking. Should the Council favourably consider the suggestion, the Company's concession will be amended.

INDUSTRIAL COMBUSTIBLE GASES.

THIS was the subject of a paper read before the Mechanical and Engineering Section of the Franklin Institute by Mr. J. M. RUSBY, the Engineer of Tests to the United Gas Improvement Company, of Philadelphia. It was intended to present an outline of the qualities and origin, or method of production, of the most important gases used in the arts, &c. The text, accompanied by numerous illustrations, was given in a recent number of the "Journal" of the Institute, of which the author is a member; and the following are some extracts from it.

INTRODUCTORY.

The special merits of gaseous fuel, which indicate the advantages obtained by the gasification of solid, and to some extent even liquid, fuels, are the following: It is easily transportable, and capable of subdivision and use in even the smallest quantity. It is quickly combustible, and its flame, and consequently its heat of combustion, are capable of concentration. Undesirable impurities, which are incapable of removal from the solid or liquid fuels, can be purified out from their cooled gases, which in many processes is of great importance. It is easily combustible without production of smoke. It is also possible to form from a solid or liquid fuel a gas having a greater heat of combustion, and consequently a higher flame temperature, than the solid or the liquid elements from which it is produced. A very notable instance of this is acetylene (C_2H_2), the combustion of which yields a much greater heat, and a correspondingly higher flame temperature, than is yielded by its constituents when burnt in their uncombined state.

The gasification of solid fuels in a central gas plant, and the distribution of the gas for divided uses, offer enormous advantage. In the case, for instance, of domestic appliances for burning solid fuels, the combustion of this fuel is, in general, imperfect, and probably exceedingly so; also, owing to the slowness of putting solid fuel-fires into and out of operation and the difficulty of limiting combustion when heat is either not required or required only to small extent, a further very serious waste of fuel is produced. In addition to this, the labour of handling the fuel and the ash and managing furnaces is great. On the other hand, in the central station gas-works apparatus is operated continuously, and with the maximum efficiency of heat consumption and minimum cost for labour. The gas is delivered to the consumer exactly when, and in such quantity as, he desires; and its consumption is begun and terminated instantaneously just when required, its combustion is perfect, the heat is utilized with a maximum of efficiency, and the labour of controlling the gas-consuming appliance is almost nothing. The rapid advancement of the use of gas for domestic fuel testifies to this; and it is a probability of the future that the domestic gas-heating appliance will displace the coal-burning appliance, except possibly in cases of very large-scale fuel consumption.

CONSTITUENTS OF INDUSTRIAL GASES.

The following table gives the essential properties of the elementary combustible gases which, mixed in certain proportions with each other and with incombustible diluting gases, constitute the various industrial combustible gases.

TABLE I.

Gas.	Heat of Combustion, B.Th.U.		Air Required for Combustion.	
	Per Cubic Foot.	Per Pound.	Per Cubic Foot.	Per Pound.
			Cubic Ft.	Pounds.
Carbon (to CO)	..	4,350	..	5·771
Carbon (to CO_2)	..	14,544	..	11·541
Carbonic oxide	323	4,368	2·393	2·471
Hydrogen	326	61,523	2·393	34·624
Hydrocarbon Gases.				
Methane	1009	23,838	9·570	17·312
Ethane	1764	22,226	16·748	16·156
Ethylene	1588	21,430	14·355	14·836
Acetylene	1477	21,465	11·963	13·313
Hydrocarbon Vapours.				
Benzene	3807	18,447	35·888	13·313
Toluene	4552	18,699	43·065	13·547
Xylene	..	..	50·243	13·720
Naphthalene	..	..	57·420	12·984

The combustible elements in all these gases are, of course, only two—carbon and hydrogen, the only ones available and recognized in practice as fuels. Carbon exists in combustible gaseous form in the hydrocarbons and also in carbon monoxide—the product of its incomplete combustion with oxygen. Hydrogen exists in the hydrocarbons, and is also obtained, for the production of gas, by the decomposition of water.

Hydrocarbons.—The hydrocarbons are of much importance; the luminosity of gas-flames being entirely due to them. They also contribute largely to the heating power of many gases. For instance, ordinary carburetted water gas and coal gas derive more than half their total heating power from them. They are, of course, the sole source of production of the pure oil gases. The hydrocarbons are divided, it will be observed, into two groups—gases and vapours. The gases are not condensable at atmospheric pressure, nor at any existing atmospheric temperature; and consequently each one is capable of being distributed and utilized, unmixed with other gases if desired, in the gaseous form. The vapours, however, at ordinary atmospheric temperatures have a pressure less—and in the case of those of great molecular weight very much less—than that of the atmosphere, and consequently would be condensed to the liquid form if subjected to atmospheric pressure. Therefore, in order that they may be transported in their vaporous form, they must be mixed with one or more of the permanent gases, which shall serve as a "carrier." It will be observed that the vapours have far the greatest weight of molecule and weight per cubic foot; their vapour pressure, which is a measure of their ability to retain the vaporous form under pressure, generally decreasing as the weight of molecule increases. Both gases and vapours have, as shown by the table, high heating power per cubic foot.

The most important source of the hydrocarbon gases and vapours is their production in the manufacture of artificial gas from oil and the volatile portions of wood and bituminous coals by the process of destructive distillation. In this process, the foregoing materials are subjected to the action of heat either to vaporize the liquid in the case of oil, or to volatilize the volatile portion of the material if a solid. If the materials are subjected to only a sufficient degree of heat to produce this vaporization, the distilled products will be, in great part, merely heavy vapours; and on being subjected to atmospheric temperature and pressure they will recondense to the liquid form. They are, therefore, incapable of distribution as gas. These vapours, after distillation, are subjected to a still higher degree of heat. Under this treatment there is a chemical change produced. In this transformation there is, in general, a reduction of the molecular weight of the vapours—some free carbon being thrown down (lampblack or soot), and some free hydrogen liberated; and the resulting gas will be a mixture of free hydrogen, permanent hydrocarbon gases, and small percentages of various vapours which are carried by the permanent gases. This mixture is capable of distribution. If the degree of heat to which the original vapours are subjected in this process of destructive distillation were very high, they would be completely decomposed into their constituents, carbon and hydrogen. For the production of a gas of both good luminosity and good heating power from oil or coal, the original distilled vapours are made to attain a temperature of about 1300° to 1400° Fahr.

Carbon Monoxide.—When oxygen unites with carbon in combustion, two products may, and in general will, be produced—carbon monoxide (CO) and carbon dioxide (CO_2). The latter is the product of complete combustion, and is itself, of course, incombustible. Carbon monoxide is the product of incomplete or partial combustion, and is itself a combustible gas. The relative proportions in which carbon monoxide and carbon dioxide will be formed are dependent upon the pressure and temperature at which combustion takes place and the length of time of contact of the air and gases formed with the carbon. Since in general gas-manufacturing operations the pressure is practically that of the atmosphere, the temperature and time of contact are the controlling conditions. The quantity of carbon monoxide produced will increase, and that of carbon dioxide decrease, as the temperature is raised or the velocity of flow lessened. Special experiments show that with an exceedingly slow rate of flow and a fuel (carbon) temperature of about 1900° Fahr., practically only carbon monoxide is formed; the carbon dioxide in the gas being only about one-half of 1 per cent. With dry carbon and dry air supplied at 60° Fahr., however, the heat of formation of the former will be sufficient to produce an actual temperature of offgoing gas of about 2250° Fahr., and a somewhat higher maximum temperature of fuel.

Hydrogen.—As stated above, in gas manufacture hydrogen is produced from the decomposition of hydrocarbons. Another source fully as important is the decomposition of water vapour by its contact with a hot "reducing" agent. In the manufacture of combustion gases this reducing agent is, very generally, incandescent carbon (coal or coke). The oxygen taken from the water vapour and uniting with the carbon may, as shown in the above case of carbon monoxide production, form either carbon monoxide or carbon dioxide.

The percentage of the total steam supply which will be decomposed and the respective percentages of carbon monoxide and carbon dioxide which will be formed are, as in the foregoing production of carbon monoxide, dependent upon the pressure and the temperature at which the reaction takes place and the length of time of contact—the percentages of steam decomposed, and carbon monoxide formed increasing with increasing temperature of reaction and time of contact. In a quiescent state of steam and gas, or

with so slow a flow as to approximate this, special experiments show that a fuel-bed temperature of 1900° Fahr. is sufficient to decompose practically all the water vapour supplied and produce only the carbon monoxide. In practical work, the fuel bed is operated at a much higher temperature than this, in order to permit of effecting these chemical changes at the high velocities of steam and gas actually employed; also, in pure water-gas manufacture, the heat necessary for these reactions must all be stored in the fire by preliminary heating. Owing to the velocity and gradual dilution of the steam, a very considerable percentage of it will remain undecomposed, and there will also be some carbon dioxide formed, even at the high temperatures employed in practical work.

Materials Employed for the Manufacture of Industrial Gases.

The author gave tables showing the kinds and volume percentages of the various elementary gases which, in simple mixture, constitute industrial gases, the properties (illuminating and calorific power, flame temperature, &c.) of these gases, and their suitability for various uses; also, in the case of artificial gases, the materials from which they are produced. He took as typical gas-making materials peat, lignite, bituminous coals, anthracite, and oil, and in the following table showed the constituents of the gases produced by their destructive distillation:

Table II.

—	Peat Gas.	Lignite Gas.	Bituminous Coal Gas.	Oil.	Gas.
Illuminants	6·0	3·0	3·8	0·4	38·1
CO	17·0	18·2	8·7	5·0	0·5
H_2	27·0	44·1	50·5	78·9	3·4
CH_4	19·0	15·4	28·2	11·0	57·7
C_2H_6	..	..	2·8	..	..
CO_2	27·0	13·0	2·1	1·1	..
O_2	1·0	1·3	0·4	0·6	..
N_2	3·0	5·0	3·5	3·0	0·3
Candle power	..	..	13·0	none	60·0
Calorific power (B.Th.U.)	467·8	424·0	10·0	394·0	1488·0
Specific gravity	·826	·596	·428	·222	·881

In the next table is shown the composition of various gases:

Table III.

—	Water Gas.		Producer Gas.		Natural Gas.
	Uncarburetted.	Carburetted.	Anthracite.	Bituminous.	
Illuminants	..	10 7	..	..	0·1
CO	43·5	33·4	25·0	22·0	0·2
H_2	47·3	38 1	14·2	10·5	..
CH_4	0·7	7·6	0·5	2·6	97·1
C_2H_6	..	2·4	..	0·6	..
CO_2	3·5	3·3	6·3	5·7	..
O_2	0·6	0 7	0·1	0·4	0·5
N_2	4·4	3·8	53·9	58·2	2·1
Candle power	none	20·2	none	none	5·0
Calorific power (B.Th.U.)	302·0	602·0	132·0	132·0	982·7
Specific gravity	·559	·676	·871	889	·566

The author then gave the following brief statement of the qualities necessary in gases for various purposes, and the suitability of the foregoing gases for these uses.

Flame Temperature.—In cases where low-temperature work is to be done, high flame temperature is, of course, not so essential to efficiency of utilization of heat. In other cases, however, as, for instance, in the use of gas for illuminating by the Welsbach mantle, the melting of refractory metals, &c.—where the effect desired is obtained only at a high temperature—a very hot flame or products of combustion is very necessary for efficiency in the utilization of heat, since it is only the excess of temperature of the flame above the physically or chemically necessary point which accomplishes any useful work. Recuperation, or heating of air and gas before combustion by the heat of the waste products of combustion, can in many cases be practised, and thereby increase the efficiency of a low flame temperature gas; but in many other cases, as in the use of gas for illumination or other purposes, where gas is divided and used in small individual quantities, it is impracticable. The gas and air supply must be cold, and consequently the gas must be capable of yielding high flame temperature under this condition.

If a flame be protected from any loss of heat by radiation or conduction, the products must carry away all the heat generated; and consequently the quantity of heat generated divided by the quantity of heat necessary to raise the products of combustion one degree in temperature will give the rise of temperature. Adding to this the temperature of the gas and air before combustion will give the final flame temperature. This can be approximately calculated. It cannot be accurately calculated, however, for, though heats of combustion of elements and gases have been accurately experimentally determined, the heat required to raise the temperature of the products of combustion one degree ("specific heat") has not, though approximately correct information has, been obtained.

Even if we possessed the correct foregoing data for the calculation of flame temperature, however, that which exists in practice would be less, for the following reasons: There is unavoidably some loss of heat from a flame, while combustion is in progress, by radiation and conduction. It is impracticable to obtain the ideal proportions of air and gas in combustion. There is also undoubtedly delayed combustion. In very hot flames, the temperature of dissociation of a portion of the products of combustion is reached, and the combustion will consequently not be completed until some heat is dissipated.

Below are given the flame temperatures of certain gases—some determined by direct experiment, and others calculated.

Table IV.

Substance.	Burned with	Temp. in Degrees Fahr.	
		Experimental.	Calculated.
Carbon to CO_2	Air	..	3540
Carbon to CO	,,	..	2260
CO to CO_2	,,	..	3670
Hydrogen	,,	3450	3510
,,	Oxygen	4400	..
Illuminating gas	Air	3400	..
,, ,,	Oxygen	4000	..
Acetylene	Air	4600	..
,,	Oxygen	7200	..
Producer gas (with anthracite)	Air	..	2735

In order that the foregoing may have some practical significance, the following few temperatures required in certain common high-temperature industrial operations are quoted from various authorities:—

Table V.

	Degrees Fahrenheit.
Ordinary lamp	2200 to 2650
High-pressure (high gas consumption) lamp	2400 ,, 2850
Melting point of cast irons	2000 ,, 2500
,, ,, wrought irons	2700 ,, 2900
,, ,, steels	2200 ,, 2700
,, ,, nickel	3000
,, ,, platinum	3227
,, ,, quartz	4000 +

The foregoing figures indicate that hydrogen, carbon monoxide, and the hydrocarbons are all capable of giving very high flame temperatures, and that consequently coal gas, carburetted and uncarburetted water gas, the oil gases, &c., which are composed of them, and this with little dilution by incombustible gases, are all suitable for high-temperature operations. Producer gas, on the other hand, owing to the presence in it of large quantities of incombustible nitrogen and carbon dioxide, gives a far lower temperature.

A point in connection with this subject which is worthy of a moment's notice is the following: In Table I. are given the actual heats of combustion of the various hydrocarbons entering into the composition of some of the commercial gases given in the two succeeding tables. If we calculate the heats of combustion of the elements (carbon and hydrogen) contained in these hydrocarbons, and compare them with the actual heats of combustion of the hydrocarbons themselves as given in Table I., the two will be found not to agree. This is for the following reasons: As is the case in all chemical combination, heat is evolved in the union of the carbon and hydrogen to produce these hydrocarbons, and, of course, the molecule will correspondingly resist decomposition into its elements, which decomposition must take place before combustion can occur. This heat absorption in decomposition will therefore affect the heat of combustion as compared with the calculated heat of combustion of the constituent carbon and hydrogen, as stated. Methane (CH_4) has the highest heat of formation of the hydrocarbons we are considering. Its heat of combustion per cubic foot is 1009 B.Th.U.; whereas that of its constituent carbon and hydrogen is just about 100 B.Th.U. greater. Its flame temperature, therefore, must be somewhat lower than that of its elements.

This heat of formation of hydrocarbons is, however, generally low. Indeed, in a number it becomes apparently negative, which means that the work of decomposing these hydrocarbons for combustion is less than that which would be required in decomposing the elements (carbon and hydrogen) in their elementary condition. A very notable and practically important instance of this is acetylene (C_2H_2). The heat of combustion of one cubic foot of this gas is about 1477 B.Th.U., whereas the sum of the heats of combustion of the two constituents (carbon and hydrogen) is only 1250 B.Th.U. Since the products of combustion from the elements and the gas are identical, the flame temperature of the gas must be much the higher. This fact accounts for the high flame temperature of acetylene, which contributes to its very high illuminating power, and renders the gas valuable for certain practical uses, such as the cutting of metals, &c.

Luminosity.—In former times, light was obtained from only those gases giving luminous flames. Though this method of obtaining light from gas is still employed, it is becoming largely displaced by the use of the Welsbach mantle. The luminosity of gas-flames is due to the presence in the gas of hydrocarbons; and these are generally obtained only from high-grade bituminous coals and oil. Consequently, for the furnishing of a luminous-flame gas we are considerably restricted in our choice of materials and also our methods of manufacture, which must necessarily

mean increased cost of gas. With the Welsbach light, on the other hand, it is only required that the gas shall furnish a high-temperature flame; and it is easy to manufacture from a very wide range of fuels gases—for instance, uncarburetted water gas, a feebly luminous mixture of uncarburetted water gas and coal gas, or else a low-grade coal gas—which will have very high flame temperature.

Hydrocarbons in a gas, as already shown, do not necessarily increase the flame temperature; and those existing in the bulk of the industrial gases are of no more value for the production of heat or flame temperature than is carbon in the fixed form in all the fuels from which can be readily produced the foregoing satisfactory gases. Furthermore, the quantity of heat required to furnish a given quantity of illumination is vastly less with the Welsbach mantle than with the luminous flame. One candle-hour can be obtained with the Welsbach light with a consumption of from 36 B.Th.U. with the ordinary low-pressure light to 20 B.Th.U. with special, but now very commonly used, high-pressure lights. With the luminous flame, and using the good grade of coal gas shown in Table II., 235 B.Th.U. will be required to furnish one candle-hour. The foregoing facts are tending, and very properly, to lessen the legal requirements imposed with respect to the luminous-flame qualities of commercial gas; and this movement is certain to continue.

Calorific Power and Weight.—From what has been said, it will be seen that the calorific power of a gas per cubic foot does not necessarily affect flame temperature (compare uncarburetted water gas, coal gas, and rich oil gas—all gases of high flame temperature), and is therefore not of importance with respect to the heat efficiency of the gas when consumed. In the matter of distribution of gas, however, where expensive pipes and appurtenances and pumping machinery must be employed, this calorific power and also the weight or specific gravity of the gas have an influence which merits a moment's attention. Consider, for example, the transportation and distribution of a given quantity of energy per hour in two gases which could be made from bituminous coal—one being producer gas and the other a mixture of coal gas distilled from this coal and the uncarburetted water gas which can be made from its residual coke. Approximately, these gases would have respectively calorific powers as 1 : 3, and specific gravities as 2 : 1. It is evident that the quantity to be transported of the first gas is at least three times that of the second, which will require pumping machinery of three times the capacity. Also, from the law of flow of gas through pipes, with identical pressure conditions in pipes, the first gas would, because of its threefold volume and greater specific gravity, require pipe capacity (sectional area) about four times that required for the second gas, and would call for mechanical work by pumping machinery more than three times that needed for the second gas. Or, with identical pipe capacity, the pressures for the first gas must be much higher than, and the mechanical work of compression many times as great as, for the second gas. In long-distance transmission of gas, where the initial pressure would be some or many atmospheres, this work of mechanical compression is an item of importance. The foregoing striking example is chosen simply for illustration. Naturally, the manufacture of such a gas as this producer gas for long-distance distribution would not be attempted.

Manufacture of Artificial Gases.

The author next gave a brief description of the methods of manufacturing the various artificial gases shown in Tables II. and III., and set forth the general theoretical principles underlying these methods. He also gave illustrations of representative forms of apparatus for the production of each of these gases.

Coal Gas.—Dealing first with coal gas, which forms a very large portion of the entire commercial supply of combustible gases, especially those distributed for sale and use for illumination and other domestic purposes, he briefly considered the materials used in its production, since they affect the quality of the resulting gas. He pointed out that the effect of the constitution of the material used upon the gas produced will be seen by a comparison of the various gases—those from peat, lignite, and bituminous coal—of which analyses are given in the tables. The chief difference in the quality of these gases is caused by the varying quantities of the oxygen content of the respective materials. At the temperature of distillation and gasification, this oxygen unites with part of the carbon in the fuel to form carbon monoxide and carbon dioxide; the latter being formed in very heavy quantity and passing off with the gas produced. This dilutes the combustible gases, and being itself incombustible, it lowers the heating power and flame temperature of the gas; also, it very seriously injures the luminous qualities of the gas. The removal of the carbon dioxide by purification processes would be expensive. It may be removed by passing the gas through incandescent carbon; but this will result in a destruction of the hydrocarbons. Furthermore, it will be observed that the low-grade materials contain a large percentage of moisture, which will even remain in very considerable quantity after the most thorough drying practically possible. This is objectionable in the process of distillation. Also, the coke formed is generally of very poor quality. These facts prevent the use of these low-grade materials for the production of coal gas. The material generally employed is a high-grade, highly volatile bituminous coal.

Having described the process for the distillation of coal for the production of illuminating gas, and briefly indicated the nature of the residuals, the author said the quantities of gas and bye-products to be obtained from one short ton (2000 lbs.) of coal of the quality shown in Table II. would be, in good practice, as follows, though the individual figures would vary somewhat according to the apparatus and other conditions: Gas, 10,500 cubic feet; total coke, 1300 to 1350 lbs.; ammonia, 5 lbs.; tar, 12 gallons—the illuminating power, with a flat-flame burner, being 13 candles.

Dealing further with this subject, the author said: The quantity of fuel consumed in the carbonization of coal will, in present general gas-works practice, be about 300 lbs. per 2000 lbs. of coal carbonized—depending on the kind of apparatus and other conditions. The heat from this fuel will pass away from the apparatus in various ways, and the respective percentages dissipated through these various channels will evidently vary according to the form of apparatus and its operation. Some experiments have been made to ascertain the division of this total heat expended. One such experiment, made with much care with a horizontal retort-setting, gave the following results:

	Per Cent.
In waste chimney gases (1112° Fahr.)	25·2
In sensible heat of coal gas (1202° Fahr.)	13·8
In sensible heat of coke (1742° Fahr.)	18·5
Radiation, &c.	20·7
Latent heat of formation of gas, &c.	21·0
Heat of discarded ash	0·8

It is of interest to note that this experimenter and others have carefully calculated from the analyses of the coal and the gas and other compounds distilled therefrom the quantity of heat required for the mere distillation of the volatile portion of the coal, and also that developed by internal reactions during this distillation. While the different figures do not exactly agree, they all indicate that the net external supply of heat required is very small, or, in other words, the internal reactions generate quite, or very nearly, enough heat for this distillation.

The author then gave an illustrated description of the various types of coal-gas generating apparatus used in practice. On the subject of vertical retorts, of which he showed a setting by the United Gas Improvement Company, he said: The advantage of this form of retort is that it permits charging of coal and discharging of coke by gravity; thus greatly lessening the labour cost for these operations which exists in horizontal retorts. Another advantage is that the plant occupies much less ground area for a given capacity than is the case with horizontals; also, because of the greater depth of the charge of coal and the slower distillation, the coke produced is of excellent quality—dense, firm, and suitable for metallurgical operations—and contains less fine material, or "breeze," which is of much less value than the larger coke.

A noteworthy feature of this form of retort, as compared with the horizontal forms, is that the entire cross section of the retort is filled with coal. This leaves no, or very little, free space between the coal and the sides of the retort. Consequently gas is distilled at the surface of the coal, and in great part flows inward towards the cooler interior of the charge, rises through it to the top of the retort, and is discharged. There is, therefore, less danger than in the horizontal form of decomposing of the hydrocarbons of the gas by contact with the very hot sides of the retort. Indeed, in this particular system, an empty heated space is left above the top of the charge of coal, through which the gas flows slowly, and is subjected to additional heat for its more complete gasification. The gravity charging and discharging feature of vertical retorts makes possible continuous charging and discharging; fresh coal being constantly fed to the top of the retort, and coke withdrawn from the bottom. In most recent constructions, these retorts are about 18 feet in length, and receive from 1000 to 1700 lbs. of coal per charge. The time required for the carbonization of this charge is from nine to twelve hours. The empty space above the coal is about 4 feet in length.

Coke-Oven Gas.—The desire for coke-producing apparatus which should be more economical in respect to recovery of the bye-products—gas, ammonia, tar, &c.—than the old beehive oven, has led to the development and the very extensive modern use of the bye-product coke-oven. The gas produced from these ovens is becoming increasingly important for use in industrial purposes, and even in part for distribution, for general public use, by gas companies. These ovens are designed primarily for the production of a superior grade of coke suitable for metallurgical purposes, &c. Consequently, the kind of coal chosen for use and the method of operation are generally such as to produce this best grade of coke. The gas is a bye-product, and of secondary consideration. In many cases, only the richest portion of the gas, which is that given off during the earlier part of the carbonizing period, is sold for public supply; the remainder being used to heat the retorts. But it is possible, with a good grade of coal and careful operation, to produce a gas of very fair quality.

These ovens are generally installed of very large capacity, and require heavy machinery and appurtenances. They are not generally suitable for the use of moderate-sized works for the production of coal gas; furthermore, the quality of gas is not under such thorough control as in the smaller forms of retort, and is generally somewhat inferior. For gas-works use, the horizontal or vertical form of retort is preferable.

Water Gas.—Since, in the manufacture of carburetted luminous flame water gas, one part of the operation is the production of uncarburetted or "blue" water gas, the production of both kinds can be considered together. The generating apparatus proper consists of three steel shells, called respectively the generator, carburettor, and superheater, all lined with fire-brick—the car-

burettor and superheater being filled with fire-brick laid in chequer form, so as to be easily traversable by gases. The generator contains a bed of fuel—anthracite coal or coke—of generally from 5 to 7 feet in depth. The succeeding vessels (scrubber and condenser) are simply for the cooling of the gas and the extraction of tars, &c. The operation of the apparatus is intermittent or in cycles, consisting of two parts—the heating operation or "blow," and the gas-making operation or "run." [The author described these operations.] The composition of the gas—percentage of hydrocarbons, &c.—and its calorific and illuminating power can, of course, be changed by varying the quantity of oil used.

The kind of fuel required for water-gas manufacture is one containing very little volatile matter. If much be present, as in bituminous coal, the heat absorption required for its distillation will tend to keep the temperature of the fuel below the point at which combustion can take place and steam can be successfully decomposed. Moreover, the efflux of gas formed from the volatile matter must tend to prevent the contact of steam with the fuel; thus further preventing the decomposition of the steam. Though bituminous coal has, to a slight extent, been used in water-gas generators, its conversion into coke, after being charged upon the fuel bed, must be completed before it will successfully effect the decomposition of steam. This slow process has prevented its successful use for water-gas manufacture.

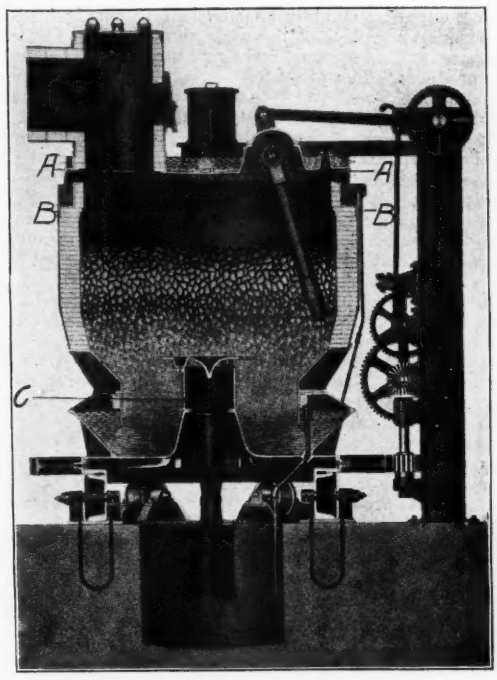
Producer Gas.—The use of this gas is so common, and the theory of its production so simple, that little explanation of the subject is necessary. The method generally adopted is one of the following: (1) Steam is admitted, mixed with the air supply, to the fuel bed, and is decomposed, producing "blue" water gas mixed with the producer gas proper. (2) Products of the complete combustion of carbon (nitrogen and carbon dioxide) are returned, mixed with the air supply, to the fuel bed. A portion of the carbon dioxide is decomposed by the hot fuel, forming carbon monoxide; each volume of the former decomposed yielding two volumes of the latter, which means that for each pound of carbon contained in carbon dioxide which is actually decomposed by the fire 2 lbs. will be carried away from the fuel bed. From Table I. it will be seen that the decomposition of the carbon dioxide containing 1 lb. of carbon will absorb 14,544 B.Th.U.; while the formation of the resulting carbon monoxide containing 2 lbs. of carbon will evolve only 8700 B.Th.U. There is, therefore, a strong cooling action on the fire, which will be increased if, as is generally the case, the products of combustion returned to the fire are of a somewhat low temperature.

The second method has the superiority to the steam admission method in that the products of combustion used can be those formed from the producer gas itself when burned in engines, furnaces, &c., and can thus be circulated indefinitely; whereas in the process of the simple admission of steam to the fuel bed this steam must finally be discharged to the atmosphere in waste products of combustion, and its sensible heat and latent heat of evaporation are thus wasted. This process yields a producer gas which is considerably diluted, and which will have, when burned from either a hot or a cold condition, a lower flame temperature. This last fact is in some cases an advantage—for instance, in furnaces it yields a more uniform, even though lower, temperature, and thus avoids possible danger to brickwork, &c.

The fuels used for the manufacture of producer gas can be any of the solid ones referred to early in the paper; large quantities of even lignite and peat being employed in certain localities, though it is generally preferable to use a good grade of bituminous or anthracite coal. Where bituminous material is used, the volatile combustible is driven off by the heat of the fire, and then the yield of the producer gas proper from the resulting coke takes place. If the distilled hydrocarbons, &c., from the volatile combustible be removed (mixed with the producer gas proper) from the producer without excessive heating and consequent decomposition, it will give a gas of materially greater heating power, higher flame temperature, and capable, because of the presence of the hydrocarbons, of being burnt with a somewhat luminous flame of greater heat radiating power, which is desirable in some furnace uses. Moreover, such treatment of the distilled and volatile matter renders possible the recovery of tar and ammonia, which are protected from destruction by excessive heating. This object, if desired, is attained by the removal of the distilled gases from the producer close to the point where the coal is charged. If, however, the foregoing is not desired, the design of the producer is such that the hydrocarbons, &c., distilled from the volatile matter of the coal are caused to pass through the highly heated portion of the fuel bed, and are thus by excessive heat broken up more nearly into their elements. This converts the heavy vapours, which would otherwise be deposited as tar, in great part into fixed gases; and this greater freedom from tar and vapours is in some cases an advantage.

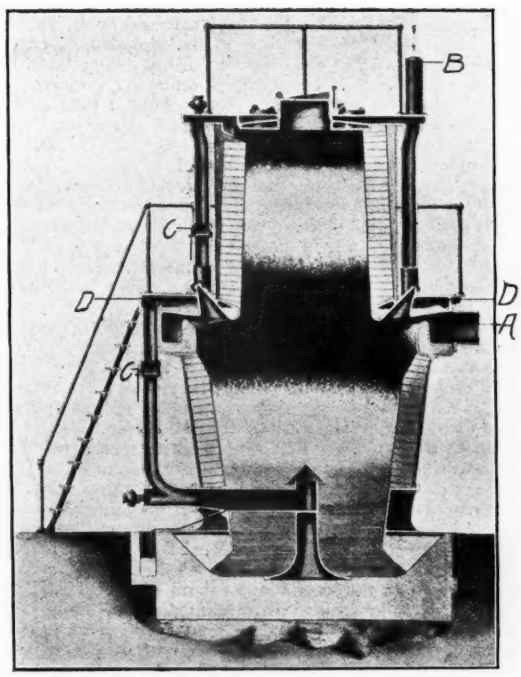
The accompanying illustration represents a producer suitable for the use of bituminous fuel, and of the form alluded to in the preceding general remarks. In it, the hot producer gas proper passes off through the top of the fire; assisting in the distillation or carbonization of the bituminous fuel, and carrying the distilled gas directly from the producer without its further decomposition by heat. The cover A is stationary; while the body B, together with the fuel bed, is continuously being rotated by the mechanism shown.

Bituminous fuel will generally, on being heated, melt or assume a plastic condition, which will interfere with the flow of the air and producer gas. In the Hughes producer, provision is made



The Hughes Producer.

for the continual breaking-up of this plastic coal, and also the agitation of the general fuel bed and the working-down of ash to the bottom. This is effected by means of the long arm shown, which projects down from the stationary cover into the fuel bed. This arm continually rocks backwards and forwards; and as the body of the producer with the fuel bed is rotated, there is produced a continual breaking-up of the fuel. The air and steam supply for the fuel bed are forced into its bottom through the vertical tuyere C shown. By means of the annular opening at the base of the producer, which contains a water-seal for the prevention of communication with the atmosphere, the ash can be removed as desired.



The Westinghouse Double-Zone Producer.

The next illustration shows another form of producer—the Westinghouse double-zone—suitable for the use of bituminous fuel. In this form, however, provision is made for the exposure of the gases distilled from the bituminous coal to a higher degree of heat—thus more thoroughly gasifying the heavy vapours and tars. The coal is charged upon the top of the fuel bed. The air supply for the combustion of the fuel is admitted in two parts—one over the top of the fuel bed, and the other through the tuyere at its base. The air supplied to the top of the bed

produces a partial combustion sufficient to supply heat for the carbonization or coking of the coal; the coke thus formed then descending, and its combustion being completed in the lower part of the producer. The producer gas, with its contained vapours distilled from the coal, from the top of the fire passes downward through the hot fuel, and is removed through the pipe A at the middle of the height of the producer. The producer gas as it is formed at the bottom of the fire rises, and is discharged through this pipe.

This producer is of the suction type—the producer gas being drawn off by an exhauster; and this suction draws in the air supply for combustion through the inlet B. By means of the valves C, the total air supply for the producer is divided between the top and the base in any desired proportion. The air supply, before its admission to the fuel bed, is passed over water, which is used for cooling the producer head, and also over the water contained in the ring D at the middle of the height of the producer, which latter is heated by the waste heat of the offgoing producer gas. The incoming air is thus charged with the water vapour necessary for the supply to the fuel bed. The water-sealed opening at the bottom of the producer permits of the removal of ash as desired. The breaking-up of the plastic fuel, working down of the fuel bed, &c., in this producer are effected by hand stoking. Stoking-holes are provided for this purpose in the head of the producer, and also at various points in the ring D, which afford ready access to all points of the fuel bed.

Oil Gases.—The method most generally employed for the production of gas from oil is that of simple destructive distillation. In this process, the oil is introduced into a closed vessel or retort, and subjected to heat. A temperature of 700° or 800° Fahr. will generally suffice for the practically complete vaporization of even heavy crude oils. As explained in Table I., however, these vapours would, if subjected to atmospheric pressure and temperature, immediately recondense to the liquid form. They are therefore subjected to a still higher heat, to transform them into permanent gases. It is very generally desired thus to produce an oil gas which shall have both high heating power per cubic foot and also high illuminating power. The temperature which the oil vapours must attain for such gasification is about 1300° to 1400° Fahr. Under higher temperature of gasification than the foregoing, there is further decomposition of these oil vapours into their constituents, free carbon and free hydrogen. It is generally impossible to convert all the oil into a mixture of permanent gases and vapours capable of transportation. A considerable portion of the vapours will be so heavy that they are incapable of carriage, even when heavily diluted with permanent gases; and the vapours, mixed with free carbon, will be thrown down in the form of tar at the outlet of the generating apparatus.

A very considerable quantity of gas is also manufactured by mixing the oil vapours with steam in the destructive distillation process. At the temperature of gasification of these vapours, some of this steam will undergo decomposition by the portion of free carbon liberated from the oil gas, and there will thus be formed a mixture of oil gas and uncarburetted water gas.

Large quantities of oil gas are manufactured, compressed into portable reservoirs, and used for car, &c., lighting. This gas endures the high degree of compression employed (15 atmospheres even) without serious loss of volume, heating power, or luminous efficiency. Very considerable quantities of oil gas are manufactured, by the process indicated in the preceding paragraph, from the very heavy crude oils of the West, and used for public gas supply. Another interesting modern form of oil gas supply is to compress a gas of ordinary quality under a pressure of about 100 atmospheres, liquefy thereby roughly one-half of it, and then deliver this liquid product in strong steel capsules for domestic purposes. On releasing the liquid, in whatever quantity desired, from the capsule, it is so volatile that it at once reassumes the gaseous form ready for use. There is thus obtained from the portable liquid gas of high heating power at any burner pressure desired.

INSPECTION OF GAS-LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

District Inspectors' Reports.

In the preceding issue of the "JOURNAL," the last annual report of the Chief Inspector under the Alkali Works Regulation Act, 1906 (Mr. W. S. Curphey), was fully dealt with. We now give some extracts from the reports of the District Inspectors.

As usual, the first report is by Mr. E. G. Ballard, the District Inspector for Ireland, where there are 63 works, in which 79 processes are carried on. He paid 137 visits and made 87 tests last year. In his report for 1911, he had to complain of "a certain degree of slovenliness in the condition of the plant;" and he now says some of the smaller sulphate of ammonia works might with advantage be kept more tidily. But, looking at the district as a whole, the works are carefully conducted; and several improvements have been made since the last report was issued. Taking all the places where sulphate of ammonia is made in Ireland, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 35; the number burning it, 3; those working on the continuous system of distillation, 33; and those working on the intermittent system, 5. The proportion of total liquor distilled by the two systems was 97·9 and 2·1 per cent. respectively. Products equal to 2976 tons of sulphate of ammonia were made during the year.

In addition to Ireland, Mr. Ballard has under his supervision Cheshire, North Wales, and part of Lancashire, in which are 90 works and 145 separate processes. Seven of the latter are carried on in gas-liquor works; and they were all carefully conducted. All the works in the district employ the continuous process of distillation for their ammoniacal liquor in the manufacture of sulphate of ammonia. At all the tar-works, efficient means for dealing with the noxious vapours evolved at certain stages of the process of distillation are adopted. On one occasion Mr. Ballard had to complain of neglect on the part of the proprietor to use the arrangement provided for the purpose; and it was the subject of severe reprimand. All the other works of this character were carefully carried on.

Reporting upon the North of England district, Mr. E. Morley Fletcher says two new sulphate of ammonia and gas-liquor works were registered during the year; making a total of 82. One plant is in connection with a gas-works—oxide of iron being adopted for dealing with the foul gases from the saturator—and the other with coke-ovens, where the ammonia is recovered by the direct process. The quantity of sulphate made during the year shows a decrease compared with 1911, due to the coal strike. Many ovens had to be shut down, and some time necessarily elapsed before they could be put in full work again.

In the district comprising Widnes, Runcorn, and Liverpool, which is under the supervision of Mr. Herbert Porter, there are 42 alkali and other scheduled and registered works, and the number of separate processes under inspection last year was 100. The different methods of treating the sulphuretted hydrogen evolved from gas-works liquor are shown as follows, in terms of sulphate of ammonia percentage of the total make: Absorbed by lime or oxide of iron, 15·1; by combustion, 9·1; by other methods, including absorption in ammoniacal liquor, 75·8. Mr. Porter says all this class of plant, as well as that for the distillation of tar, was properly worked and maintained during the year.

Reporting upon North and East Lancashire and part of Yorkshire, Mr. H. J. Bailey says there were 58 premises registered for the processes connected with the production of gas liquor and sulphate and muriate of ammonia during last year. At 51 of them, sulphate of ammonia was produced; at 10, gas liquor; and at three, muriate of ammonia. The proportion of ammonia produced by continuous distillation was 96·9 per cent. of the whole, calculated as sulphate. Ammonia liquor produced at coke-oven plants was distilled at four works. At two of them, the Claus process dealt with the foul gases emitted; and at one, the foul gases were destroyed by combustion—the average total acidity of the chimney gases at the works being 0·8 grain per cubic foot, expressed in terms of sulphur trioxide. The purifiers and plant were kept in order during the year, and no cause of complaint arose.

Mr. Robert D. Littlefield, in his report upon the East Midland district, states that the number of works registered as sulphate and muriate of ammonia and gas-liquor works is one more than before—viz., 60; eight of them being liquor-works. During the year 1911, a new installation of plant for the complete direct absorption of the ammonia contained in coke-oven gases was inaugurated; and the process worked so satisfactorily that additional plant of the same type is under construction. Sulphate of ammonia is made at 52 works—as to 50 of them by the continuous process, and as to the others by the intermittent process. The proportion of liquor distilled by the former process amounted to 99·4 per cent. of the whole.

The total output of sulphate of ammonia in the district shows an increase of 3·5 per cent. over the amount similarly produced last year. Taking the quantities of sulphate of ammonia made at ordinary gas-works and coke-oven works respectively, the increase from the former class amounted to 4 per cent. and from the latter to 3 per cent. over the 1911 output. Mr. Littlefield says these figures reflect the influence of the coal strike, the effect of which was to stop coke-oven plants entirely for a time; while the obligations of the gas companies compelled them to manufacture gas in most instances with great difficulty and expense. It is noticeable that the output of sulphate of ammonia from coke-oven and producer plants just exceeds that from the other two sources operating in the district. The proportions of ammoniacal liquor dealt with, using the sulphate of ammonia equivalent as the basis of the calculation, were as follows: Gas-works, 47·3 per cent.; carbonizing works, 2·2 per cent.; coke-ovens, 46·9 per cent.; producer gas, 3·6 per cent.

Mr. Edward Jackson, who has the supervision of the South Midland and Norfolk district, says there are now 112 works registered where sulphate, chloride, or carbonate of ammonia is manufactured or gas liquor concentrated. At a number of these works,

more than one of these manufactures is carried on. At 104 works, sulphate of ammonia is produced; at 6 works, muriate of ammonia; and gas-liquor is concentrated at 15 works. So that there are 125 different plants for carrying on the above-named processes. There were six new registrations for works of this class during the year—five having sulphate of ammonia plants, and the other being a gas-liquor works. Four of the sulphate plants are connected with ordinary gas-works, and have continuous stills, with hand-fishing saturators, and efficient condensers; and in each case oxide of iron heaps are employed to arrest the sulphuretted hydrogen. The other sulphate plant is in connection with coke-ovens; and the direct method of sulphate of ammonia manufacture is adopted. The plant referred to last year as having been erected at a small gas-works for the direct recovery of ammonia from the crude coal gas by washing it with weak sulphuric acid continued to work satisfactorily during the past year.

Mr. Jackson says the number of "patent" coke-ovens is still gradually increasing in the district. At several works, already registered, additional ovens were erected last year, and others are being built. Though only one additional works was added to the register last year, several plants are in course of erection at works not hitherto registered. There are already 22 works where ammonia compounds are recovered from coke-ovens. Sulphate is manufactured at all of them save one, where all the liquor is concentrated. Liquor-concentrating plants have also been erected at three other works, but are only occasionally made use of. Three muriate of ammonia plants are also in operation, for the extraction of this compound from the thick tar from the gas-mains. As stated, the sulphate of ammonia manufactured at these works is still increasing; but the coal strike interfered considerably with the output of sulphate in most of the works. Had it not been for this compulsory short-charging of the ovens, there would have been a much larger production than there was. However, the sulphate of ammonia from this source represents 38 per cent. of the entire production in the district.

The proportions of ammoniacal liquor from the various sources in the district dealt with, using the sulphate of ammonia equivalent as the basis of calculations, were as follows: Gas-works, 46·8 per cent.; coke-ovens, 38 per cent.; producer gas, 12·3 per cent.; iron-works, 1·9 per cent.; carbonizing-works, 1 per cent.

There are now 43 tar-works in operation in Mr. Jackson's district. Four additional works were registered during the year, and at two of them there were erected stills for producing "prepared tar" (dehydrated) for road-dressing. At one works, a Wilton still has been put down, with a small lime purifier attached, to arrest the uncondensed vapours. At the other, two ordinary stills have been erected; and the uncondensed vapours in this case are dealt with by combustion. At the two remaining new works, both the plants are connected with coke-ovens. At one of them, a double 20-ton still (primary and secondary) has been built; and the uncondensed vapours from the worm end, as well as from the closed iron pitch-cooler (which is under suction), are burnt under the fire. At the remaining works, there are four 20-ton stills; the uncondensed vapours from the worm ends, as well as the pitch-coolers, being drawn away, and forced into an alkaline absorbing solution. With regard to the previously registered 39 works, the methods for arresting and rendering innoxious the offensive vapours are the same as reported last year.

Dr. Alfred C. Fryer had 171 works and 238 processes under inspection last year in the district comprising the South and South-West of England; and he was again assisted by Dr. Bailey. Ten new works were added to the register; four being for the manufacture of sulphate of ammonia, and one for the distillation of tar. The plant at the latter was not in operation during the year; but it is kept in readiness to start when required. The number of works registered at the close of the year where either ammonium sulphate or ammonium chloride is manufactured was 105. Four new works were registered for sulphate of ammonia manufacture—one being on the direct method. The new plants have continuous stills, hand-fishing saturators, suitable condensers, and oxide of iron purifiers. In one small gas-works the manufacture of sulphate has been discontinued, and the plant all dismantled. Three works have built new sulphate-houses and erected new stills in place of more antiquated arrangements. New saturators have replaced old ones at eight of the plants; and five works have put in new oxide of iron purifiers. The proportion of liquor distilled by the continuous process last year was 96·8 per cent.

Dr. Fryer reports that the ammoniacal salts manufactured in his district might be considerably increased if all the gas undertakings worked up their gas liquor or sold it to the manufacturer. The coast line of the district is more than 600 miles in extent; and at the present time many small gas-works, and some of even a larger output, run their liquor direct into the sea without any attempt at utilizing it in the manufacture of sulphate of ammonia. There are also many small gas-works in country districts that are unable to sell their liquor on account of the cost of carriage, and it is run to waste. This waste is to be seriously regretted now that it is an established fact that sulphate of ammonia can be profitably manufactured in gas-works where the annual output of gas is low. Of course, the amount of sulphate of ammonia made per ton of coal carbonized must be less at these smaller undertakings than in the larger works, where almost continuous working proceeds and the waste of ammonia is comparatively small. It is, however, considered that gas-works producing as small a quantity as 5 million cubic feet of gas per annum can profitably take up the manufacture of sulphate of ammonia. Mr. Philip G. C. Moon showed this in a paper he read before the Southern District Association of Gas Engineers and Managers in 1910.* Sulphate of ammonia plants which are comparatively inexpensive in construction, and the working of which can readily be understood by any workman of ordinary intelligence, can now be adapted to all small gas undertakings. Surely, remarks Dr. Fryer, the many gas-works that are sending their liquor into the sea might well consider whether it is right to permit this waste of a valuable product; and small gas-works, where difficulty exists in selling the ammoniacal liquor, and where the carriage heavily depreciates its value, will find that the simple direct method of making sulphate of ammonia will be a boon to them.

Dealing further with this subject, Dr. Fryer says:

> Some managers of small sulphate of ammonia plants have much to learn in respect to economies that may be carried out by a simple, inexpensive rearrangement of plant. For example, frequent loss is occasioned by injecting the milk of lime into the still at irregular intervals by a hand-pump. Spasmodic pumping allows the fixed ammonia to be lost by passing into the effluent without liberating the ammonia, and, consequently, satisfactory results cannot be obtained. This defect has been superseded at several works by some simple form of injector, which is so arranged that a fairly continuous feed of milk of lime is delivered on the still. At one or two works, efficiency has been further obtained by increasing the seal of the trays of the still and obtaining extra agitation of the liquor. This is found specially beneficial when the free ammonia on the lower tray is in excess of what is regarded as desirable. At more than one works, a loss of ammonia has been found to have resulted when the man in charge has allowed the contents of his saturator to get so low that the cracker-pipe is liable to become unsealed. This is frequently the case when he has not grasped the fact that there always exists a marked difference in level between the liquor on the two sides of the curtain. In a few small works, considerable care is taken to regulate the supply of liquor to the saturator; while the sulphuric acid is poured in at irregular intervals and in such varying quantities that at one time the liquor is high in gravity while at another it possesses an undue alkalinity with a low gravity.

The distillation of tar is carried on at 16 works in this district. In three of them, the combustion method is in use for rendering the worm-end gases inoffensive before being discharged into the atmosphere. In the others, lime and oxide of iron purifiers are employed to arrest the noxious gases. Dr. Fryer remarks that, from the financial view, it would appear that road surveyors and engineers who employ tar for road surfacing find it a real economic necessity. The suppression of the dust nuisance takes a secondary place to the important financial effects the practice has in savings on road scavenging, watering, and maintenance, and by keeping grit out of the sewers. This demand for "prepared tar"—that is, tar from which the water and naphtha have been removed by partial distillation—is increasing; and suitable apparatus has been installed at several works.

The number of works registered last year in the district comprising South Wales and Monmouthshire, which is under the supervision of Dr. T. L. Bailey, was 120—an increase of three, following one of five in the year 1911. There was no change in the number of sulphate and muriate of ammonia works last year; but an increase in the near future is anticipated. Three new sulphate plants were almost ready for registration when the report was written; and, in addition, several bye-product coke-oven plants are projected. The total amount of ammonium salts, in terms of sulphate, produced in the district was 3½ per cent. less than in 1911—this reduction being more than accounted for by the stoppages due to the coal strike. In spite of this, however, the production was practically 10 per cent. more than that of the year 1910. At one works, where the capacity of the existing plant had become severely taxed, a duplicate plant has been installed. At another, where the plant was beyond repair, an entirely new plant is being erected. The working of the various units has been very satisfactorily conducted.

One additional works for the distillation of tar was registered last year; the total number now being six. They were all well conducted. An unfortunate gassing accident took place at one works in May, due to a workman carelessly entering an empty still, during the working of neighbouring stills, without its being cut off, as it should have been, from the waste-gas main. Two men, following for rescue purposes, were also gassed; but fortunately none of the cases proved fatal. Dr. Bailey says great praise is due to the manager of neighbouring works, who rendered invaluable aid, and to whose energetic action is undoubtedly due the fact that no lives were lost.

Mr. F. Napier Sutton reports a decrease of two works in the district comprising the Eastern and South-Eastern Counties. The scheduled and registered processes under inspection at the close of the past year numbered 278—an increase of one. Gas liquor is concentrated or distilled for the manufacture of various ammoniacal compounds at 91 works. The products consist chiefly of sulphate of ammonia, but include carbonate, chloride, and nitrate of ammonia, and liquid (concentrated and refined) and anhydrous ammonia. The total products made in the district show an increase of some 400 tons (in terms of sulphate) compared with the preceding year; and Mr. Sutton says this figure would have been greater but for the coal strike, which largely increased the make of carburetted water gas. The gas-works belonging to the statutory companies and local authorities produced 90·8 per cent. of the products—0·5 per cent. more than last year; and the

* See "JOURNAL," Vol. CXII., p. 474.

balance of 9·2 per cent. was made in the works of private firms. Of the total quantity of gas liquor made, 98·9 per cent. was treated by continuous distillation methods, and only six small intermittent distillation plants now exist in the district.

The Hills desulphurizing process operated for many years at large works has remained idle, and is not likely to be used again. The Claus sulphur-recovery process has not been extended; indeed, the use of one plant was abandoned in the course of the past year, and the proportion of gas treated by this method has dropped from 16·9 to 13·8 per cent. Mr. Sutton says the acid gases have a very destructive action on the brickwork and mortar of the depositing chambers. To overcome this, an acid-resisting cement of great density and hardness has been devised at one of the works, and is under trial on several of these structures, and so far promises well. Absorption of the foul saturator gases in hydrated oxide of iron is practised at 62 of the 91 works of this class; but, these being mostly small works, the proportion of gases treated only amounts to 11·2 per cent. The use of oxide heaps, as against box purifiers, continues to extend; and the life and absorbing qualities of this simple type of purifier have in many cases been improved by enlarging the internal gas-distributing area.

The combustion neutralization method of treatment of gases is used at ten works, and accounts for 7·5 per cent. of the total. The furnaces and neutralizing towers were well maintained and usually carefully worked last year; and the average neutralization figure is satisfactory. One instance of neglect leading to a serious escape of sulphuretted hydrogen came under observation, and proceedings would have been instituted for recovery of a penalty had not the previous record of the works been entirely satisfactory.

The original process of Radcliffe for the treatment of spent liquors, wherein the combustion neutralization process is incorporated, remains in use at two works; but the results are not included in the following table, which shows the efficiency yielded by neutralizing plants in the past two years:—

Total Acidity of Gases as SO_3. Grains per Cubic Foot.			Percentage of Acid Removed and Neutralized.	
Leaving Furnace.	Leaving Washer.	Leaving Limestone Scrubber.	1912.	1911.
80·50	..	2·65	96·7	94·6
16·80	2·00	1·10	93·4	92 4
21·80	11·75	0·40	98·1	98·0
50·30	12·36	3·81	92·5	96·4
36·50	20·00	0·15	99·5	99·3
..	..	..	*	99·7
31·81	9·76	1·01	96·8	97·9
..	..	..	Idle	95·1
35·28	..	1·30	96·3	95·1
Average 38·99	11·17	1·49	96·1	96·3

* Plant not found at work.

At four works the saturator gases, amounting to only 0·7 per cent., are passed to the coal-gas purifiers. At two works only are the saturator gases burnt in retort or boiler flues. One of these is a very small gas-works, the other deals entirely with the ammoniacal liquor recovered from the carbonization of bones.

Mr. Sutton makes the following remarks:

Many gas engineers do not yet realize the great loss of ammonia which occurs through unsuitable handling and storage of gas liquor. Approximately four-fifths of the total ammonia content is in a free state, and consequently very easily lost on exposure to air. Yet it is common to see liquor falling and splashing into half-empty storage-tanks, and these often with large openings, instead of passing down a pipe to below the liquor level. Storage in overhead tanks, often entirely open or with a very unsound covering, and fully exposed to the sun, is frequent; and wonder is expressed that the yield of ammonia per pound of coal carbonized compares unfavourably with others. No storage other than below ground, and that with the smallest possible vent, is advisable; and where this is not available, the liquor should be worked up at frequent intervals. Again, much unnecessary loss of fixed ammonia occurs through the practice of liming the stills intermittently; and here the contractors for the erection of plant are largely to blame. A continuous automatic visible feed of milk of lime is easily designed and adjusted, and it should be fitted to every continuous still. The practice is extending as knowledge spreads; and wherever the system has been installed, increased yields of ammonia on the coal carbonized have followed.

One works for the distillation of tar was closed during the year, and small dehydrating plants were erected at three works; making 23 works engaged in distilling tar partially or completely. The increasing demand for tar in road construction and maintenance, coupled with the effect of the coal strike early in the year, greatly curtailed the supply for distillation purposes, and the values of raw tar and of certain products have still further risen in consequence. Appliances exist at all works for dealing with the permanent and offensive gases evolved during the process of tar distillation. Occasionally these were found ineffective, as the result of forgetfulness or temporary neglect; but, Mr. Sutton reports that, in general, the plant is well maintained and carefully worked, and there was no complaint as to this class of works.

Report to the Secretary for Scotland.

As usual, the Chief Inspector's report to the Local Government Board, noticed last week [p. 229], is accompanied by one presented to the Secretary for Scotland, which embodies a report by Mr. J. W. Young, B.Sc., the District Inspector for this part of Great Britain. We will deal with the latter first.

Of the 281 processes under inspection by Mr. Young, 106 relate to the manufacture of sulphate and muriate of ammonia, 6 to the treatment of gas liquor, and 41 to the distillation of tar. The quantity of sulphate of ammonia produced was—

	Tons.
Gas-works	21,339
Iron-works	15,861
Shale-works	62,207
Producer-gas, coke, and carbonizing works	20,940
Total	120,347

There were 107 works registered for gas liquor and sulphate and muriate of ammonia processes last year; and they received 287 visits. The output would probably again have shown a slight increase if the miners' strike in the spring had not caused a stoppage of many blast-furnaces. The total quantity of gas liquor distilled was equivalent to 21,339 tons of sulphate—all treated on the continuous system at 65 works. There were 41 works registered for the distillation of tar; and there was no change in the appliances or methods. Where purifiers (generally of lime) were in use, they were kept in good order.

In the course of his report, the Chief Inspector points out that the production of sulphate of ammonia in Scotland was somewhat reduced last year. The net difference was 992 tons, due to the disturbing effect of the coal strike in the early part of the year, and was the result from varying differences in the several industries which contribute towards the total as set forth thus:—

	Increase. Tons		Decrease. Tons
Gas-works	1133	..	—
Iron-works	—	..	3000
Shale-works	1442	..	—
Producer gas, coke, and carbonizing works	—	..	567
	2575	..	3567
Decrease on balance	992		

Despite the adverse influence of the strike on coal supplies, the gas-works showed a marked increase, due probably to the combined effect of available stocks of coal and an increased demand for gaseous fuel while solid fuel was limited in quantity and high in price.

The direct system of producing sulphate of ammonia continued in satisfactory operation during the year; but so far it has been restricted to coke-oven gases. No application to gas-works practice has yet been made in Scotland.

As in England, the oxide of iron purifier is the most generally used agent for preventing the escape of the sulphuretted hydrogen evolved during the manufacture of sulphate of ammonia. The reaction between oxide of iron and sulphuretted hydrogen continued to be under consideration, and the results so far obtained were dealt with in Mr. Curphey's report to the Local Government Board, as noticed in the "JOURNAL" last week. He takes the opportunity of further thanking Mr. Ballantyne, the Gas Engineer at Hamilton, and Mr. A. Mackay, of Motherwell, for their thorough and willing co-operation with his desire to obtain additional information as to working conditions in purifiers connected with the manufacture of sulphate of ammonia. In these works, conditions varied somewhat from those existing at Dundee, where similar information was so fully and readily collected for him in 1911.

In continuance of the table presented in recent annual reports of the progress of shale distillation and ammonia recovery, Mr. Curphey gives figures compiled from the statistical returns to the Home Office on Mines and Quarries for the last ten years—to December, 1912, and from returns of sulphate of ammonia manufactured. There was comparatively limited variation in the ratio between the sulphate of ammonia produced and the shale mined in Scotland, though the general trend is upwards.

The Marchal Coal-Testing Apparatus.—The current number of "Le Gaz" contains an illustrated description of a coal-testing apparatus devised by M. Marchal which shows the total quantity of residual products contained in the coal under test. One kilogramme (2·2 lbs.) of dry coal is taken, as this is sufficient to eliminate all cause of error arising from the test being carried out to too great a nicety, or from irregular heating. It is claimed that the apparatus gives, in a single analysis, all the results which are of interest, and that they are obtained by reproducing, as nearly as possible, the conditions of carbonizing met with in industrial furnaces.

Sulphate of Ammonia from Coal in Natal.—We learn from the "Chemical Trade Journal" that a report has just been made of the discovery of a rich seam of anthracite coal, 5 ft. 6 in. thick, which runs for several miles round a mountain side at Vryheid, in Natal, and is said to be so accessible that it could be sold as ordinary fuel at 1s. 9d. per ton. The outcrop is of such a nature as to make it peculiarly adapted for the production of sulphate of ammonia, and therefore the bulk of the fuel will be devoted to this purpose. The Mond process will be used for the conversion of the coal into sulphate of ammonia and other products. In only one case, and that in China, has coal containing more nitrogen than in the present instance been found.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Waltham Abbey Carbonizing Experiences.

SIR,—At the Institution meeting last year, Mr. Randall made serious complaints about retorts manufactured to the standard specification; and a few weeks later he amplified these to a representative of the "Gas World." In fact, he inspired an article in your contemporary, the burden of which was very similar to that which appeared in your last issue.

I immediately placed myself in communication with Mr. Randall. At his invitation, I visited his works, but was surprised to find that the retorts about which he was complaining had not been made to the standard specification, and *had really been purchased before it was issued!* Mr. Randall further explained at the time that the retorts which he was then receiving, and for which he had adopted the standard specification, would not pass the tests specified; and I suggested to him that if this was so, his remedy was to reject them. Is this the material which has again failed? The point is not at all clear; and as absence from home prevents my obtaining this information from Mr. Randall, I should be glad if he will kindly inform us what tests were carried out on this material and the result.

When the actual quality of the material we are discussing is known, I shall be quite prepared to reply to all the points raised in your article.

F. J. BYWATER,
July 26, 1913. Hon. Sec. Refractory Material Committee.

Historical Objects for the National Gas Exhibition.

SIR,—Enclosed I beg to hand you a copy of a letter which has recently been issued to the various gas undertakings, *re* historical exhibits; and I shall feel obliged if you can see your way to call attention to the subject in the "JOURNAL," and invite contributions to this section from all connected with the industry.

F. W. BRIDGES, Organizing Manager.
Exhibition Offices, 124, *Holborn, E.C., July* 21, 1913.

[ENCLOSURE.]

Dear Sir,—I am desired by the Executive Committee to inquire whether your undertaking has, and would be willing to lend for the purposes of the exhibition—

(1) Any objects of historical interest—including cartoons, prints, or drawings—connected with (*a*) the manufacture and distribution of gas; (*b*) its applications; or (*c*) the struggles associated with the early development of the public gas supply.

(2) Any oil paintings or other portraits of those who took a prominent place in the foundation or the subsequent development of the industry.

Any such exhibits which your undertaking would be willing to lend would be carefully protected, and would be insured against fire and theft.

The Committee would greatly appreciate any assistance you can render them in this matter. The work of arrangement would be facilitated by the courtesy of as early a reply as possible, with fullest particulars.

Crowborough District Gas Company.

The annual general meeting of this Company was held on the 18th inst.—Mr. Andrew Dougall, M.Inst.C.E. (the Chairman), presiding. The Engineer and Secretary (Mr. Irwin A. Cook) read the Directors' report, in which it was stated that there had been an increase of 8·42 per cent. in the consumption of gas in the year ended the 31st of March last. There was a net profit of £1016; and the Directors recommended a dividend at the rate of 3½ per cent. per annum. In moving the adoption of the report and accounts, the Chairman expressed the satisfaction of the Directors in presenting a balance-sheet which showed that they had earned enough to pay a higher dividend. He explained the figures of the accounts by comparison with those of the preceding year. With regard to the Company's prospects, he said the Bill promoted in the present session, by which they were empowered to supply not only gas but electricity, had received the Royal Assent; and as soon as there was a sufficient demand for current, the Directors intended to put into force the portion of the Act relating to electricity. He called the shareholders' attention to the provisions of the measure, and pointed out that under it they had obtained authority to raise £36,000 of additional capital, with the usual borrowing powers to the extent of one-third of the ordinary stock. With the increased capital at their command, the Directors would be able to do more in the development of the supply of gas throughout the district, and encourage in every possible way its use for cooking, heating, and other purposes. In conclusion, the Chairman said that the manufacturing results in the past year had been exceedingly good, and reflected great credit upon the Manager and workmen. The report was adopted, and the dividend recommended declared. A hearty vote of thanks was accorded to the Directors; special reference being made to the advantage possessed by the Company in having for Chairman an expert in gas matters, whose advice had been invaluable, and to whom the present position of the Company was largely due. The fees of the Directors were increased; and a vote of thanks was accorded to the staff—the services of Mr. Cook being highly spoken of by the Chairman.

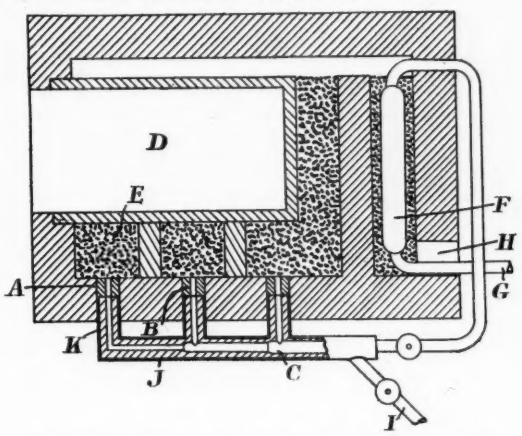
The Poisoned Fish in the Roding.—As recorded in the "JOURNAL" last week, some hundreds of fish were found dead in the River Roding, near Little Bury Mill, Essex, on Saturday, the 19th inst. At the Ongar Rural District Council last Tuesday, it was stated that they had been maliciously poisoned; the Rev. John Howard suggesting that Suffragettes were responsible, not tar washings as had been supposed.

REGISTER OF PATENTS.

Heating by Gaseous Combustion.

BONE, W. A., late of the University of Leeds, and M'COURT, C. D., of Streatham Common, S.W.
No. 6732; March 19, 1912.

This invention relates to the combustion of gases, wherein use is made of the acceleration which incandescent surfaces exert on combustion, and wherein either the air required for the combustion or the combustible gas is preheated, and wherein also both the air and the combustible gas may, if desired, be preheated. Reference is made to the earlier patents—Nos. 25,808 and 29,430 of 1909.



Bone and M'Court's Surface Combustion Muffle-Furnace.

The accompanying illustration shows, "somewhat diagrammatically and by way of example only," a muffle-furnace designed to carry out the invention "in connection with the preheating of the supporter of combustion required for the combustion of the mixture of supporter of combustion and fuel."

The furnace body, constructed of a sufficiently refractory material—such as fireclay, calcined magnesite, or bauxite—is provided at the bottom with a plurality of holes A, preferably of cylindrical bore, adapted each to receive a fireclay or the like pipe B in connection with the bore of a channel C through which the mixture of preheated supporter of combustion and fuel is caused to travel. D is a muffle, of refractory material, adapted to receive the articles to be heated. E is refractory material in a granular or fragmentary condition, which forms the bed in which the explosive mixture is burnt. The supporter of combustion is preheated by causing it to pass through a number of tubes F in the bed of refractory material. They are, preferably, packed with refractory material in granular condition, in order that the rate at which the supporter of combustion passing through them will take up the heat transmitted through the walls of the tubes may be increased. The tubes placed in the hottest part of the bed of refractory material are constructed of fireclay or other refractory material (such as plumbago); while those which are so situated as not to become heated to the temperature at which iron will burn away may be of iron. The tubes are connected at the ends G to a blower or compressor.

The products of combustion pass upwards around the muffle from the combustion zone, and then descend around the tubes, and finally make their escape at H. The supporter of combustion, which is preheated on passing through the tubes, is delivered to the channel C to which the pipes B are connected, and so reaches the bed of refractory material. A supply of fuel is also admitted to the channel C, the point of connection of the tube I through which the fuel is supplied to it being sufficiently far removed from the nearest branch channel to ensure that the fuel will be thoroughly mixed with the preheated supporter of combustion before the explosive mixture reaches the bed of refractory material. The point of connection of the tubes F and I is distant some 12 inches from the first of the pipes through which the explosive mixture enters the bed of refractory material. In order to assist in the mixing of the preheated supporter of combustion and fuel, the latter is preferably admitted to the channel C through a number of small holes.

"The channel must be of sufficiently small cross section to ensure a high speed of flow of the explosive mixture therein, in order that as little combustion as possible may take place in the channel. Where the supporter of combustion is preheated to a high temperature, it will not always be found practicable to entirely prevent combustion from taking place in the channel; and hence it will be desirable to construct this channel of a material sufficiently refractory to withstand the high temperature which at times may be produced therein. In such case the channel may be constructed of magnesite of a high degree of refractoriness."

The channel may conveniently be formed by taking an iron pipe J having iron branch pipes K, and lining it and the branch pipes with refractory material. To do this iron rods are placed within the pipe and the branch pipes and are maintained centrally of them. Refractory material is then rammed into the pipe and branch pipes, the rods withdrawn, and the entire arrangement baked.

In order that the explosive mixture passing through the channel formed in the refractory material by the iron rods, which act as (or form) cores, should at all points possess a speed in excess of the rate of propagation of combustion through the mixture, the bore of the part of the channel within the pipe J should progressively diminish in cross sectional area at each point where the bore of the channel enters a branch pipe K.

Measuring the Rate of Flow of Fluids.

THOMAS, C. C., of Madison City, U.S.A.

No. 10,454; May 2, 1912. Convention date, May 12, 1911.

This apparatus, for determining rates of flow of steam and other gases and vapours, was the subject of an earlier patent, No. 30,405 of 1909. In it was described a method of determining the rate of flow of gases which consisted in passing the gases through a casing having an electric heater arranged therein, and to which heat at a known rate was supplied—the temperature of the gases before and after heating being determined by electric thermometers.

The objects of the present invention are to improve the means for determining the rate of flow of the gases and vapours flowing through pipes or conduits, to increase the accuracy of the results obtained, to render such measurement automatic, to provide for the continuous and cumulative measurement of the flow, and to provide apparatus which is simple and reliable.

The invention may be carried out in various ways. One method is to regulate automatically the amount of heat imparted to a moving body of dry gas (including steam or other vapours), so as to maintain constant the temperature rise of the gas between two points. Another method is to maintain automatically at a constant value the heat imparted continuously to the moving body of dry gas, and then determine the temperature change in the gas. The former method is the preferred one—in which, the rise of temperature being known, the amount of heat required to produce the rise in temperature being measured, and the specific heat of the gas being known or readily determined, the rate of flow of the gas may be accurately calculated.

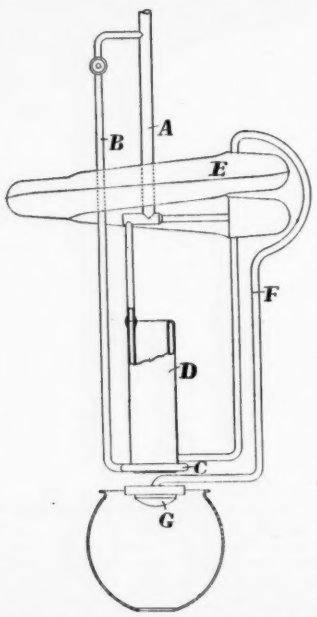
In carrying out the process, heat may be imparted to the gas from any suitable source; but in the preferred apparatus which has been constructed for carrying out the invention, the heat is supplied by an electric heater or resistance element. Electrical means for dissipating heat are, the patentee remarks, preferable for the reason that the heat loss may be readily and accurately computed from readings taken from standard instruments. Accordingly, he illustrates in the drawings attached to his specifications electrical means for automatically dissipating the heat at the desired rate, and for measuring the temperature rise produced thereby.

Supply and Combustion of Air and Gas for Lighting Purposes.

TAMSON, A. W. K., and VOSMAER, A., of The Hague, Holland, EDMUNDS, H., and KIRKE, P. ST. J., of Parliament Mansions, Victoria Street, S.W.

No. 15,126; June 28, 1912.

This invention has relation to "that process of combustion known as surface combustion, the distinguishing and essential feature of which is that a homogeneous explosive mixture of gas and air, in the proper proportions for complete combustion (or with air in slight excess thereof) is caused to burn without flame in contact with an incandescent body, to be used in the generation or production of light."



An Adaptation of the Surface-Combustion Principle to Lighting.

The body on which surface combustion takes place is constructed (in known manner) of porous or permeable refractory material and impregnated or otherwise treated with a mixture of oxides of the rare earths, such as are used in the manufacture of incandescent gas-mantles. The explosive mixture is supplied to the impregnated refractory material in such manner and at such pressure that it passes through the pores thereof and can be ignited on the outer face of the body. The gas and air mixture is placed under pressure by a compressor in which mercury is contained in a vessel and is heated by the products of combustion of the explosive mixture or by a separate source of heat. The mercury vapour is led to a power generator which solely serves to effect the suction and compression of the gas and air or the mixture. The mixture under pressure is led to the place at which combustion is to take place; and the mercury vapour, after performing its work, is condensed and the mercury led back to the vessel ready for utilization for another cycle.

The mode of carrying the invention into effect is shown—viz., a mercury compressor and a porous or permeable refractory body which, when raised to incandescence, forms the source of light.

A is the gas supply pipe; and B a branch pipe (controlled by a cock) connected at the one end to the pipe A and at the other end to a burner C, "which may comprise a surface combustion element." D is a vessel made up of two concentrically disposed cylinders connected together at their ends; the space thus enclosed being connected, at its upper part, to a branch to which the pipe A is also connected. At its lower part, the enclosed space is connected with a mercury condenser E, "of any suitable design." In the illustration, it is shown as part of a hollow helix, and is connected with the vessel D, and (by a pipe F) with the refractory body G.

The operation is as follows: Gas is first supplied through the pipes A B to the burner C, and is ignited—the flame playing on the vessel D, which is partially filled with mercury. This is volatilized, and the vapour jet sucks gas from the pipe A, and forces it under pressure into the condenser E. The mercury vapour is condensed; and the mercury flows away to the vessel D and the gas passes to a jet adjacent the refractory body G, through which it passes and by which its velocity is increased. The stream of gas issuing from the jet sucks in air, and the mixture of gas and air so formed passes to the interior of the refractory body, through the pores or interstices of which it passes. The mixture is ignited and burns on the outer face of the refractory body, "which is, as a consequence, raised to a high state of incandescence; and the refractory body forms, owing to its impregnation or treatment, a brilliant source of light." The body G being placed below the vessel D, the hot products of combustion act on it and volatilize the mercury. When this happens, the cock on the pipe B can be closed and the burner C put out of action.

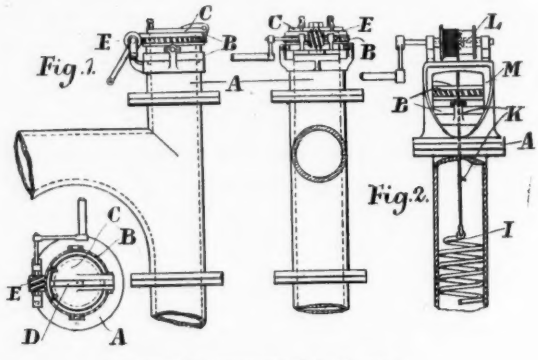
The patentees conclude their specification thus: The porous or permeable refractory material may be made by mixing fire-clay, magnesite, or the like, with a suitable organic substance—as, for example, semolina—moulding the mixture to the desired shape, and then burning the moulded body in an oxidizing flame so as to cause the particles of the organic substance to burn out and leave voids. It may be made in any of the ways described in patent No. 25,808 of 1909, granted to W. A. Bone, J. W. Wilson, and C. D. M'Court; but preferably in the way described in the penultimate paragraph of their specification.

Clearing Corrosion from Ascension-Pipes.

SMITH, F., of Weymouth.

No. 14,548; June 21, 1912.

This apparatus is intended for clearing corrosion from the ascension and arch pipes of retorts, or similar plant.



Smith's Ascension-Pipe Clearer.

Fig. 1 shows an elevation, end elevation, and plan of the apparatus in position. Fig. 2 is a sectional elevation of a winding apparatus which may be used separately, or in combination with the previous arrangement, over which it is then arranged to fit.

A metal disc A takes the bolts used at the top of the arch pipe to secure the usual cleaning tap. It is bored out to the same diameter as the arch and ascension pipes. Above the disc is a toothed wheel B, with a hinged centre piece C, in which is formed a slot D, large enough to fit the handles of the augers used in cleaning. Worm gearing E is provided with fittings complete, so that the upper portion of the combination can be revolved freely on the disc.

The apparatus works as follows: A cap is taken off the arch pipe above the stopped ascension-pipe, and the pipe-clearing apparatus is bolted in its place. The hinged top C is raised, and the clearing auger is passed down into the pipe and thrust through as far as possible. The top is then closed down so that the slot D encloses the handle of the auger. By putting the worm gearing E into action, it is possible to turn the auger easily and clear the pipe in the position where it is turned. The auger is next pushed down somewhat and again turned by the worm gearing; and the process is repeated until the whole length of the pipe is clear.

After the pipe has been cleared, the winding arrangement shown in fig. 2 may be used, whereby a spiral spring steel scraper I can be drawn up through the ascension-pipe "to effectually clear and smooth the whole bore." The arrangement comprises a bracket piece M with a part flange base, and bolt holes so that it can be slipped laterally into position, and secured by the same bolts as are used in connection with the previous operation. To the bracket is fitted gear L and a guide pulley to wind the rope or chain K which is fitted with a catch to engage or disengage with the spring steel scraper I.

Cleaning, Renovating, and Strengthening Gas-Mantles.

LANG, A., of Mildmay Park, N.

No. 19,668; Aug. 28, 1912.

This invention relates to a preparation for application to incandescent gas-mantles, with the object of regenerating their illuminating power "when impaired by long or continuous use, and also to strengthen the mantle so that it may be handled with less risk of breakage than hitherto."

To this end a solution is made comprising the following ingredients: Methylated spirits, powdered hydrocarbon, and salt, with or without a suitable colouring matter such as cochineal. The solution is applied to the mantles, preferably by spraying, and it "has for effect to clean, renovate, and strengthen same." The relative proportions of the ingredients per gallon of the preparation are as follows:—

Methylated spirits	one gallon (approximately)
Powdered hydrocarbon . .	¼ lb.
Salt	½ lb.
Liquid Cochineal	¼ oz.

To prepare the composition, the hydrocarbon (such as naphthalene) is first ground to a fine powder and then stirred into the methylated spirits and allowed to stand for about twelve hours until thoroughly dissolved. The salt, which is powdered, is dissolved in one pint of water; and the solution thus formed is then mixed with the cochineal and with the hydrocarbon and methylated spirits after they have stood as described—the whole being thoroughly stirred until completely incorporated with one another.

To make use of the preparation, a new mantle, after being initially burnt in the usual way, or an already used mantle is sprayed liberally with it, and is then lighted or re-lighted as the case may be.

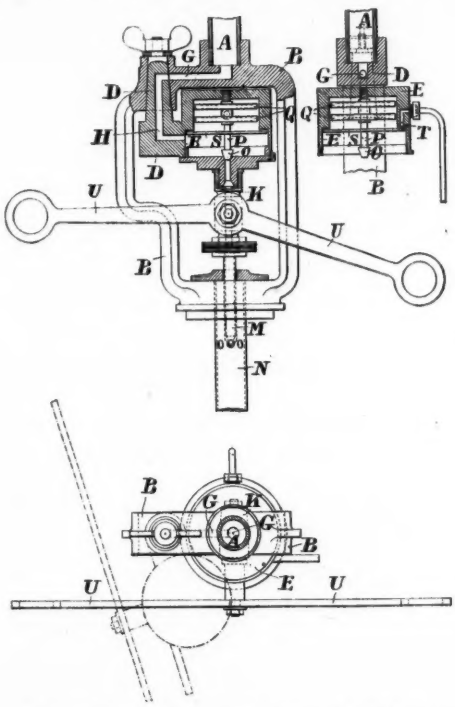
High-Pressure Gas-Lamps.

SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., of Old Kent Road, S.E.

No. 28,307; Dec. 7, 1912.

These high-pressure gas-lamps are of the kind which are ignited automatically by a bye-pass flame, on the pressure of the gas being raised sufficiently to supply the burner.

Within a box or casing through which the gas passes on its way to the bye-pass and to the burner, the patentees arrange closed collapsible chambers sufficiently stiff to withstand the small pressure of gas necessary to supply the bye-pass, but incapable of maintaining their form in the presence of the pressure of the main gas supply. The chambers are connected to the valve through which the burner is supplied; and on collapsing, owing to the full pressure of the gas being turned into the casing, they open the valve and let the gas through to the burner. At the same time the chambers operate a cover for the gas outlet to the bye-pass, which "is thus largely deprived of its supply while the burner is alight."



Chandler's (South Metropolitan Gas Company) High-Pressure Gas-Lamps.

In the illustration A is the gas-supply pipe. In the shoulder of the frame B is a socket adapted to receive a tapered plug D, which acts as a pivot upon which the box E may be turned into and out of position within the frame B [see the drawn and dotted positions shown in the plan]. Gas is led to the interior of the box E by a passage G in the frame B and passage H in the plug which meets the passage G. The bottom of the box is closed by a screw cap furnished with a central opening leading to the cock casing K to which is attached (by a milled-edge nut) the injector M. N is the mixing-tube attached to the frame B around the injector which passes through a hole in the frame.

The opening in the cap of the box E is adapted as a seating for the conical plug O which is suspended by a rod P from the "aneroid chambers" Q. These chambers are coupled together and supported by a tube screwed into the top of the box and giving direct communication between the interior of the chambers and the atmosphere. On the rod is fitted a plate or disc S adapted to cover the passage which leads to the bye-pass when the rod P is raised by the collapse of the chambers which also lifts the plug O off its seating.

Normally, when the gas pressure is low, the plug O rests on its seating and the gas supply to the burner is closed. The bye-pass passage T, however, remains open. When the pressure is sufficiently raised for high-pressure purposes, the chambers Q collapse and the plug is raised from its seat so as to allow gas to pass to the burner. Simultaneously the plate S is raised so as to cover the passage to the bye-pass, "the flame of which, under the increased pressure, would grow abnormally long if the gas supply were not curtailed to it." The plate S is not sufficiently close fitting to cut off entirely the gas from the bye-pass. The gas-cock is placed below the box E so that the supply to the burner can be cut off by the lever U without the lamp being completely out of the gas circuit. The bye-pass flame therefore continues, "but without its force being unduly increased by the high pressure within the box E."

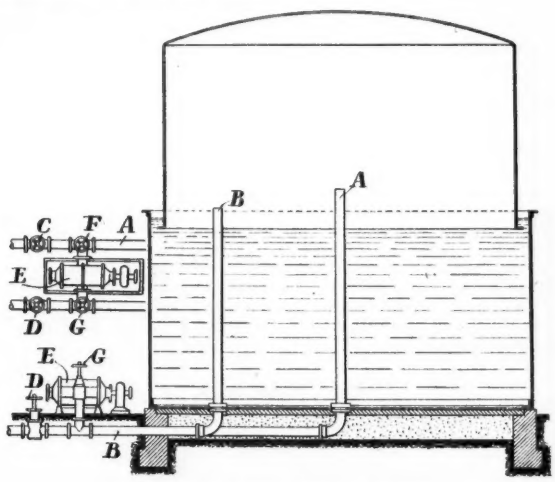
Mixing Gases of Different Specific Gravities in Gasholders.

BERLIN-ANHALTISCHE MASCHINENBAU-AKTIEN-GESELLSCHAFT, of Berlin.

No. 2281; Jan. 28, 1913. Convention date, Sept. 25, 1912.

The patentees propose that the gases within a holder should be mixed by means of a blower before the contents of the holder are delivered for consumption. To this end, between the inlet and outlet piping of the holder is arranged a blower, of any desired construction, which, after valves or cocks have been actuated, can be rendered operative, in any suitable manner, "so that gas in large quantities is drawn off from the gasholder and immediately forced back again, while the inlet and ontlet pipes of the holder are shut off from the gas generating installation and from the consumption circuit."

To ensure perfect intermixture of the gases by means of the blower, the patentees point out that the gases must be forced into the holder at so great a speed that they are impelled against the roof of it; and as when the blower starts the heavier gas which has collected in the lower portion of the holder is first drawn off, this heavy gas is forced back under the roof of the holder, spreads immediately below the latter, and gradually sinks back into the holder and becomes mixed with the lighter gases. In order at first to draw off only the heavier gases, the mouth of the pipe to which the inlet of the blower is connected is arranged close above the level of the water in the tank, while the pipe to which the discharge pipe of the blower is connected projects considerably above the inlet pipe. In this way, the jet of gas introduced by the blower impinges only against the upper layers of gas, which are those caused to eddy, while the specifically heavier gas which has collected in the lower portion of the holder is not affected by the gas-jet and steadily flows into the blower.



Apparatus for Mixing Gases in Holders.

The gasholder shown in the engraving is supplied with gas through the pipe A, while the gas flows to the points of consumption through the pipe B. These pipes can be shut off by cocks C D, so that gas from the retort-house cannot flow into the holder, nor can the contents of the latter escape to the points of consumption. Between the pipes A and B is arranged a blower E (or some other conveying device) driven in any desired manner and shut off from the pipes A B by valves F G. The gasholder inlet pipe, it will be seen, projects above the discharge pipe B. When it is desired to mix the gases stored in the holder, the stop-cocks C D are closed, while the valves F G establishing communication with the blower are opened, and the latter is started. In this way, first the gas which has collected in the lower portion of the holder bell is drawn off and forced back into the tank through the pipe A at a great speed. During this operation the gas is blown upwards in the vertical direction and impinges against the roof, under which it spreads out so as to sink down again gradually. After the blower has been working a short time, the gases within the holder are all thoroughly

intermixed. Then the blower can be stopped and the valves F G closed again. After the cock D has been opened, the contents of the holder will flow to the points of consumption, "which are thus supplied with a uniform gas."

Purification of Coal Gas.

MANCHESTER PAINT AND VARNISH COMPANY, LIMITED, and JORDAN, T. W., of Manchester.

No. 1384; Jan. 17, 1913.

This invention has for its object to provide a liquid or material for treating gas so as to prevent the deposit of naphthalene in the mains and services.

The inventors propose to saponify solvent naphtha and bring the gas into direct or actual contact with it, "whereby the naphthalene is taken up or absorbed by the solvent naphtha, which volatilizes and passes forward with the gas and acts to prevent the naphthalene from depositing."

One way of carrying the invention into practice is to add 15 lbs. of soft soap to 2½ gallons of water and thoroughly mix or dissolve it in. The water is then added to, and thoroughly mixed with, 5 gallons of solvent naphtha to saponify it.

In using the saponified naphtha, it is preferably introduced into or mixed with the liquor or water used for washing and purifying the gas. By this means, the gas is brought into actual or direct contact with the saponified naphtha, and naphthalene deposits are prevented.

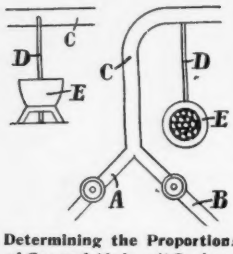
Combustion of Combustible Mixtures.

M'COURT, C. D., of Streatham Common, S.W., and BONECOURT SURFACE COMBUSTION, LIMITED, of Victoria Street, S.W.

No. 12,696; May 31, 1913.

In the Bonecourt system of combustion—in which the combustible mixture is consumed in or among a bed of refractory material, conveniently in granular or fragmentary condition, and such bed within a more or less closed furnace body, shell, or other container—it is necessary, the patentees point out, to be able to ascertain at all times, easily and quickly, and without analyzing the products of combustion, whether the constituents of the combustible mixture are being supplied in such proportions that the supporter of combustion is present substantially in the quantity theoretically required for complete combustion. The present invention has for object to enable such determination to be effected, and provides means to that end.

The inventors diagrammatically illustrate "means serving to indicate that the constituents of the combustible mixture are present therein in the proportions stated." It will be assumed that the combustible mixture comprises gas and air.



Determining the Proportions of Gas and Air in a "Surface Combustion" Mixture.

A is the gas supply pipe and B the air supply pipe—each pipe controlled by a cock so as to regulate the delivery of gas and air respectively. The pipes are connected to a conduit C connected with and supplying combustible mixture to the bed of refractory material of the heating apparatus. The mixture issuing from C is "consumed on the incandescent surface of the refractory material constituting the bed of the heating apparatus." A small proportion of the mixture is led by a pipe D (of small bore) into a furnace E, consisting of a cup-shaped fire-clay body, filled with refractory material in granular or fragmentary condition. The mixture is ignited and combustion takes place on the surface of the refractory material or in the interstices between them. Should the mixture contain a deficiency of air, an appearance of flame will be produced above the top of the refractory material contained in the furnace. In such event, the correct proportion of air required to form the mixture can be determined by gradually increasing the air supply until the flame above the top of the bed of the furnace has just disappeared. "By this means, the correct proportions of gas and air can be determined for any desired rate of consumption of gas in the main heating apparatus."

Gas Controllers.

HUME, G. W., of Hyde Park Mansions, W.

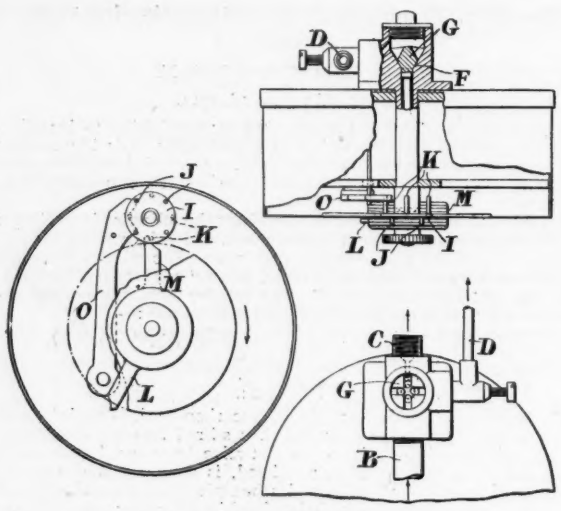
No. 7960; Nov. 8, 1912.

This gas controller is of the kind adapted to be actuated by clockwork mechanism for lighting or extinguishing one or more burners at predetermined times (such as are used in street lighting), and to that type of apparatus in which the gas-valve is operated by a toothed or pin wheel which is itself actuated by pins, or the equivalent, upon a clockwork actuated dial or the like.

The illustrations show a front view of the controller, a sectional plan view, and a rear view of the upper part.

The controller is arranged for the flow of gas to be through the pipe B to the burner outlet C and also to the bye-pass D, by means of the valve, which, as shown, comprises a casing having a conical seat F with which there co-acts a conical plug G, mounted on a spindle provided with (say) four slots which serve to control the supply of gas to the burner and bye-pass respectively when the plug is intermittently rotated as hereafter described.

I is a disc keyed upon the valve spindle and J K are the pins on the front and rear faces of the disc. The pins J on the front face are designed to be actuated by the "on" arm L and the pins K on the rear face by the "off" arm M. These arms are carried on either side of the dial, so that they are in different planes. The dial is continually



Hume's Street-Lamp Burner Controller.

rotated by clockwork. O is a pivoted spring trip-arm, the free end of which engages with the pins K upon the rear face of the disc I, so as to regulate the extent to which the disc is intermittently rotated.

The arms L and M are set to the times at which it is desired that the gas shall be turned on and off respectively; and, assuming that the gas is off, then, as the dial rotates, the "on" arm L at the proper time comes into contact with one of the pins J upon the front of the disc I, thereby turning it through a distance controlled by the spring arm O. This movement of the disc has turned the valve G so as to bring the passages in it into position for the supply of gas to the burner. As the disc continues to rotate, the arm M eventually (at the predetermined time) makes contact with one of the pins K upon the rear face of the disc and so moves the valve further—cutting off the supply of gas to the main burner, but leaving the supply for the bye-pass open.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills reported: Derby Corporation Bill, Heathfield and District Water Bill.

Bills read the third time and passed: Blyth and Cowpen Gas Bill, Pontypridd and Rhondda Joint Water Board Bill, West Bromwich Corporation Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time and committed: Aberystwyth Corporation Bill, Metropolitan Water Board Bill, Morley Corporation Bill.

Lords Bills reported: Bradford Corporation Bill, Leicester Corporation Bill, Rochford Rural District Council Bill.

Lords Bill read the third time and passed: Gas Orders Confirmation Bill.

ROCHFORD RURAL DISTRICT COUNCIL BILL.

HOUSE OF COMMONS COMMITTEE.—Tuesday, July 22.

(*Before Colonel* BATHURST, *Chairman, Sir* GEORGE AGNEW, *Mr.* O'DOHERTY, *and Mr.* SAMUEL SAMUEL.)

The object of this Bill is to transfer the water undertaking of the Rochford Rural District Council to the Southend Water-Works Company, and, incidentally, to extend the area of supply of the Company. The measure has already passed through the House of Lords [see "JOURNAL" for May 6, p. 413].

Mr. BALFOUR BROWNE, K.C., and Mr. F. N. KEEN appeared for the promoters. The Bill was opposed by the Essex County Council, represented by Mr. J. G. TALBOT, K.C., and the Honourable EVAN CHARTERIS, and the Port of London Authority, represented by Mr. LYNDEN MACASSEY, K.C. The Southend Water-Works Company were represented by Mr. G. M. FREEMAN, K.C., and Mr. TYLDESLEY JONES, who appeared against alterations in the Bill, and also against the insertion of clause 13, which was imposed by the House of Lords Committee.

Mr. BALFOUR BROWNE, in opening, explained the objects of the Bill, and the circumstances of the transfer, which were given in the "JOURNAL" at the time the Bill was before the House of Lords Committee. The circumstances are precisely the same now as then, with the exception that the Essex County Council are opposing on preamble, whereas in the other House they opposed only in respect of certain clauses; also on this occasion the Rochford Parish Council do not

appear. The Port of London Authority, as in the other House, came in order to obtain a rent from the Company, should they lay mains across the causeway known as the "Hard" connecting Canvey Island with Benfleet. In the House of Lords a clause was inserted which did not give the Port of London Authority the right to charge a rent for the use of this causeway, which the promoters claim is a road. During the course of the proceedings before the present Committee, however, an additional proviso was added to this clause, confining the Company to laying their mains over the causeway, or paying a rent should the main be laid elsewhere across this stream. Briefly, the facts are that the Rochford Rural District Council have a small water-works, which for several years has involved a loss, which has to be provided by a deficiency rate levied upon the parish councils taking the supply. A peculiarity of the position is that, owing to the system of allocating this loss, one of the parishes—namely, the Rochford Parish Council—actually make a profit on their share in the water undertaking; while the other five parishes have to bear the whole of the deficiency. The Southend Water Company have agreed to take over the undertaking on the terms of paying off the outstanding loan, and also the cost of new mains, &c., incurred since last November, when the agreement was signed—an arrangement which has been come to owing to a decision of the Local Government Board to refuse to grant a loan of £10,000 for extending the Rural District Council's water undertaking. The Southend Company's petition against alterations was more especially in regard to clause 13, which was inserted by the House of Lords Committee at the instance of the County Council, and which altered the terms of the Water-Works Clauses Act, inasmuch as it imposed upon the Company the necessity for giving a supply to consumers on a guarantee of 5 per cent. on the capital outlay, instead of 10 per cent., for three years, as provided in the general law.

Mr. TALBOT, on behalf of the County Council, objected to the Southend Water Company being heard in support of their petition. He pointed out that the Bill was promoted by the Rochford Rural District Council, and conveyed the undertaking upon agreed terms to the Company. The County Council had obtained the insertion of this clause in the other House owing to the exceptional circumstances of the district; and the Company should not be heard against it.

Mr. FREEMAN, for the Water Company, said the Company had been perfectly satisfied with the Bill as it was introduced into the House of Lords, and consequently during those proceedings he took no part in the discussion. It was only when a clause was put in against the wish of the promoters, which seriously modified the position, that the Company decided to petition against the Bill in this House in respect of alterations. One of the clauses in the agreement gave the Company the right to withdraw from it should the Bill be seriously modified in either House; and the insertion of the clause referred to would certainly cause the Company to consider the position in respect of this particular clause in the agreement. It was an extraordinary proposition that the Company, who were so much more affected by the Bill than the County Council, should not be heard in defence of their own rights.

The CHAIRMAN ruled that Mr. Talbot's objection could not stand.

Mr. BALFOUR BROWNE, dealing with the petition of the Essex County Council, referred to it as an impertinence. The County Council had nothing whatever to do in the county as a water authority, and yet they were asking the Committee to modify the Bill in various ways, and to grant powers in excess of the general law, which the House of Lords had already refused them. If the County Council's wishes were accepted by the Committee, it would mean that the Rochford water undertaking would continue in the hands of the Rural District Council, and that the high water-rates and deficiency would still fall upon the ratepayers. On the other hand, if the transfer was sanctioned, not only would the parishes be relieved from the deficiency rate each year, but the water charges would be immediately reduced 25 per cent.

Mr. *H. J. Mitchell*, a member of the Rochford Rural District Council, gave evidence in support of the Bill, and spoke of the keen desire on the part of all the parishes, with the natural exception of the Rochford Parish, to hand over the water undertaking to the Company.

Mr. TALBOT put a number of questions to witness with regard to the Bill; but the Chairman remarked that he did not know quite what the County Council were getting at. Counsel said his case was that it would be bad policy to transfer the undertaking, inasmuch as the terms were disadvantageous to the Rural District Council, who were not getting nearly enough for their undertaking.

Counsel, continuing his questions to the witness, argued that as the Company were only taking over the outstanding loans, they were obtaining the advantage of the Council having borrowed much more cheaply than the Company could have done. Witness pointed out, however, that independent valuations of the plant put the value at less than the Company would actually pay in respect of the outstanding loans. Another point of Counsel's was that the Company would have unlimited pumping powers in the district, and there would be every temptation for them to supply water so obtained in their own area of Southend if any shortage occurred, rather than in the Rochford district.

Dr. *J. C. Thresh*, the Medical Officer of Health for the County of Essex (who appeared under an order of the House), cordially supported the proposal of the Bill, and, in reply to Mr. TALBOT, said that, from his knowledge of the Southend Company, he was perfectly certain they would not supply Southend at the expense of Rochford. The main advantage to the Rural District Council would be that their water would be dependent upon the 25 wells now owned by the Company; whereas at present they were dependent on the one well only, and there was distinct evidence that the water level of the underground reservoir in that part of Essex was slowly sinking.

Mr. *M. G. Reeks*, the Consulting Engineer who advised the Rural District Council, said that he placed the value of the undertaking at £19,000; whereas the outstanding loans the Company were taking over amounted to £20,372.

Wednesday, July 23.

Some local evidence having been given,

Mr. *E. M. Eaton*, the Managing-Director of the Southend Water Company, was also called in support of the Bill. He spoke of the advantage to the Company which the possession of an additional well would be; while, on the other hand, a reciprocal advantage to the Council was that they would have a call upon the whole of the Company's existing wells for their supply. The Southend Company had now 25 wells working, and two in hand; while a large system of storage reservoirs had also been rendered necessary by the increasing needs of the district. All this, he maintained, went to strengthen the position of Rochford as regards their water supply. As an instance of the manner in which the Southend Company have treated areas which have been added to their district from time to time, he mentioned that when Billericay was added, the Bill put on the Company the necessity of laying 8 miles of additional mains. As a matter of fact, however, the Company voluntarily laid an extra 52 miles.

In cross-examination by the Hon. EVAN CHARTERIS, for the County Council, witness said that, on the basis of the present supply from the Rochford well, he would have to draw upon the other resources of the Southend Company to supply the district; but the addition of this area to the Company's district was valuable, inasmuch as it would enable future application to be made to Parliament for the sinking of additional wells.

This closed the case for the Bill.

Three witnesses were called on behalf of the Essex County Council against the proposed transfer. Their evidence was mainly directed to the fact that, inasmuch as Rochford was making a profit on their share of the undertaking at present, the ratepayers in this district would lose the benefit of this, and that if the Council's water undertaking was properly managed it could be made profitable to all the parishes.

The Hon. EVAN CHARTERIS, addressing the Committee on behalf of the Essex County Council, said that when the Bill came before the House of Lords Committee the true position was not realized, and until the evidence came out before that Committee the County Council thought they had no need to oppose on preamble. Since then, however, it was realized that there were conditions in the Bill inimical to the county as a whole; and one of the main reasons why the County Council now opposed was the statement by Mr. Eaton that the new district would be a very valuable one to the Company for sinking more wells—a concession for which they would be paying nothing, but which might, nevertheless, seriously prejudice the chances of the water supply in Rochford, inasmuch as it was open to the Company to take such water as they pleased from the district to supplement their supply in Southend. There was no question that this was an unusual proposal, and contrary to the trend of modern legislation—namely, the transfer of companies' undertakings to local authorities. Here the reverse was taking place, under conditions where the Local Authority now owning the water-works had got over their initial difficulties; and he submitted that this was not a proper time to transfer the undertaking to a private Company. The Company were also benefiting greatly, without giving any return, by the manner in which they were purchasing the works—namely, taking over the outstanding loans of the Council; but the credit of the Council was still pledged in respect of these loans, although the Company were getting the advantage of the lower rate of interest at which they had been raised. The early mistakes made by the Rural District Council which had been responsible for the loss upon the undertaking had to a large extent already been rectified; and this was a circumstance which should be taken into account when considering whether or not the terms were fair. There was an ambiguity in the facts of the case which should make the Committee pause and decide that the transfer was undesirable.

The CHAIRMAN said the Committee would not call upon Mr. Balfour Browne to reply, as they were of the unanimous opinion that the preamble was proved.

Mr. FREEMAN then made an application that clause 13, which imposed upon the Company the necessity to supply any consumer on a guarantee of 5 per cent., instead of 10 per cent., as provided by the general law, should be excluded from the Bill.

The Hon. EVAN CHARTERIS objected; but it was pointed out that witnesses had been asked no questions on this matter, and that no special circumstances had been put forward to justify an alteration in the general law.

The CHAIRMAN said that the Committee were unanimously of the opinion that the ordinary law should be imposed, and that the House of Lords amendment on this point should not be allowed to stand in the Bill.

The Hon. EVAN CHARTERIS then submitted a number of clauses on behalf of the County Council, modifying the terms of the Water-Works Clauses Act, on the ground that there were special circumstances in the district to justify this action. In submitting them, he impressed upon the Committee that the Water-Works Clauses Act had been passed as far back as 1847, and that it had not been modified since; whereas the conditions which the Act had to deal with—such as, for instance, road making—had all changed considerably. In this respect the provisions of the Act of 1847 were absolutely fossilized. The first clause proposed was that the Company should not open the roads for more than 100 yards at a time.

Mr. FREEMAN said that he knew of no case in which any of the proposed clauses had been put upon promoters by Committees.

The Hon. EVAN CHARTERIS concurred; but said they had been inserted in Bills by agreement in many cases.

The CHAIRMAN said the Committee would require to be convinced as to the manner in which Essex was different from any other county before they would accept any modification of the general law.

Mr. FREEMAN, in order to save time, said he would agree to a limit of 400 yards with regard to the opening of roads for laying mains; and this offer was subsequently accepted.

The Hon. EVAN CHARTERIS submitted another clause, under which compensation would be paid to the County Council for damage, loss, or expense caused by leaking or defective mains.

Mr. FREEMAN contended that this was covered by section 28 of the Water-Works Clauses Act.

Considerable discussion subsequently took place on the point as to whether the Committee were prepared to depart from the general principle that in this Bill no alteration would be made in the general law as regards the clause matters. It was pointed out to the Committee that Essex was different, in that this part of the area included Southend, which was growing at an enormous rate, but which was served by very narrow roads. A scheme, it was said, had been arranged with the

Road Board for an expenditure of £250,000 upon road works; and it was important, for instance, that the County Council should have a voice in deciding the position of mains under the new roads, owing to the heavy expense of taking up the surfaces in case of any trouble.

The CHAIRMAN ultimately ruled that, as a general principle, the Committee were opposed to any alteration in the general law.

The Hon. EVAN CHARTERIS, as a result, said that in the circumstances he would not take up the time of the Committee any longer.

The Bill was then ordered to be reported for third reading.

MIDDLESBROUGH EXTENSION.

Gas Companies' Opposition.

HOUSE OF COMMONS COMMITTEE.—Tuesday, July 22.

(*Before Colonel* BATHURST, *Chairman, Sir* GEORGE AGNEW, *Mr.* O'DOHERTY, *and Mr.* SAMUEL SAMUEL.)

The earlier proceedings of the Committee on this Bill have already been reported in the "JOURNAL" (pp. 187, 249). When the Committee resumed this morning,

Mr. BALFOUR BROWNE said he had, since the adjournment, had an opportunity of considering the Chairman's decision with regard to Eston and Normanby; and under the circumstances he did not intend to avail himself of his right of reply. He proposed to accept the decision; and as to Ormesby, this being now unopposed, he would ask the Committee to pass the Order, adding Ormesby to Middlesbrough. There had never been any opposition from the Ormesby Council; and the Gas Company had been settled with.

The CHAIRMAN announced that the Committee found the preamble of the Order proved in these terms.

The following is the clause which has been inserted in the Order for the protection of the North Ormesby Gas Company.

For the protection of the North Ormesby Gas Company, Limited (hereinafter referred to as "The Company"), the following provisions shall have effect—that is to say

(1) So much of section 35 of the Middlesbrough Extension and Improvement Act, 1866, and of any other Act or Order as empowers the Mayor, Alderman, and Burgesses of the County Borough of Middlesbrough (in this section referred to as "the Corporation") to supply gas in that portion of the urban district of Ormesby which is within the area of supply of the Company, is hereby repealed.

(2) If in the next two sessions of Parliament the Corporation shall introduce, and *bonâ fide* promote, a Bill for the purchase of the undertaking of the Company, the Company shall not oppose any such Bill, except so far as it may be necessary to secure the insertion therein of such clauses for the protection of their interests as are compatible with the provisions of this section.

(3) Any such purchase shall be for such price or consideration, and upon and subject to such terms and conditions, as may be agreed upon between the Company and the Corporation, or, failing agreement, shall be determined subject to the provisions of this section by arbitration in accordance with the provisions of the Lands Clauses Acts with respect to the purchase and taking of lands otherwise than by agreement; and in the construction of the said provisions, the expression "promoters of the undertaking" shall mean the Corporation, and the expression "lands" shall mean the undertaking of the Company. The Corporation shall, after service of notice to treat, be entitled to access at all reasonable times to the books, documents, and accounts relating to the undertaking of the Company, for the purpose of ascertaining the value of the undertaking, except the books relating exclusively to the shareholders in, and the constitution of, the Company.

(4) The Company shall not, after the deposit of any such Bill in Parliament, and during the promotion thereof, issue or raise any capital or borrow any moneys, except so far as may be necessary for carrying on their undertaking in the ordinary course of business.

(5) The expression "the undertaking" includes all the gas-works, mains, pipes, and machinery and plant, fixed and movable, and all other, the real and personal property, assets, and effects of whatever nature, and all the rights, powers, and privileges vested in, or belonging to or had or enjoyed by, the Company in relation to the supply of gas at the date of transfer of the undertaking to the Corporation, except

(*a*) All cash balances (other than consumers' deposits), reserve funds, undivided profits, book and other debts, bills of exchange, cheques, and other negotiable securities in the possession of the Company or of their bankers or agents on the date of the completion of the purchase.

(*b*) All rents and charges accrued due prior to the date of the completion of the purchase, with proportionate parts of accruing rents and charges up to the same day.

(*c*) All books relating exclusively to the shareholders in, and the constitution of, the Company.

(*d*) Movable stock in trade and other stores which shall be taken over by valuation at the date of transfer.

(6) The Corporation shall pay compensation to the Secretary and Manager in the regular employment of the Company who shall not be retained by the Corporation in the same or similar office, and at the salary and on the terms and conditions in and on which he was employed by the Company on July 1, 1913, in respect of any loss of office or diminution of salary or income by reason of the transfer of the undertaking to the Corporation; the amount of such compensation, in default of agreement, to be determined by arbitration in accordance with the provisions of the Arbitration Act, 1889. And he shall not lose his right to compensation as aforesaid by reason of his refusal to accept employment under the Corporation, nor shall such refusal be taken into account as a ground for reducing the amount of compensation to be paid.

(7) If, and when, the Corporation shall become the undertakers under the District Council Order—*i.e.*, Ormesby Electric Lighting Order, 1900, which has been transferred to the Cleveland Power Company, as defined by Article XI. (2) of the Order—the following provisions shall apply.

(i) The Corporation shall, on the expiration of the third complete financial year after they have commenced to supply electrical energy under the District Council Order, and on the expiration of each third succeeding year, reconsider, and, if necessary, revise, and thereafter maintain the scales of prices charged for electrical energy under the Middlesbrough Corporation Electric Lighting Order, 1898, as extended by the Order; so that, so far as is reasonably practicable, no rate will be required for the purpose of defraying the future expenses of the said undertaking during the next three years. Provided nevertheless that

(*a*) The prices to be charged shall not exceed the maximum prices which may be charged under the said Order of 1898.

(*b*) The scales of prices so reconsidered and revised may be from time to time in like manner reconsidered and revised by the Corporation.

(ii) There shall not be made against the district rate or any other rate, for energy used by the Corporation for street lighting or any other purpose, a charge at a higher price than that charged to consumers using energy for similar purposes, and for the like hours of supply.

PROGRESS OF SUNDRY PRIVATE BILLS.

Various Committees of the House of Lords and House of Commons had under consideration last week the following Bills, which were sent forward for third reading.

Gas Orders Confirmation Bill.—This was before the Unopposed Bills Committee of the House of Commons on Thursday. It has already passed the House of Lords, and deals with the Kibworth, Midsomer Norton, Redditch, and West Staffordshire gas undertakings. In the Midsomer Norton Order, Mr. Bonner Maurice, on behalf of the Board of Trade, called attention to clause 29, which gives the Company powers to contract with the Local Authority for giving a supply in bulk. The period included in the Order is fourteen years, compared with the usual seven years. It was explained that the additional seven years had been allowed in this case for the reason that the Company was a small one, and it would take a good deal of money to provide the means of supplying the Local Authority. The Chairman called attention to the high price—namely, 5s. 10d.—in the West Staffordshire Order. Mr. Bonner Maurice said that this had been gone into very carefully, and it was found to be extremely unlikely that at the commencement the Company would be able to charge anything less than 5s. 6d., having regard to the necessary capital expenditure; and therefore it was decided to allow a little margin over this. The Board of Trade, it was added, do not like these high maximum prices; but powers are taken in the Order to alter the maximum price or to fix a standard price should circumstances make it necessary. As a matter of fact, the promoters in this case asked for a fixed standard price; but the Board of Trade did not think this was at all a suitable case at present for a standard.

Local Government Provisional Orders (*No.* 6) *Confirmation Bill.*—This measure, which deals with Provisional Orders in respect of the Burton-on-Trent, Kendal, Stockton-on-Tees, and Torquay Gas-Works, was before the Unopposed Bills Committee of the House of Lords last Tuesday.

Local Government Provisional Orders (*No.* 17) *Confirmation Bill.*—This Bill, in which are included the Provisional Orders in respect of the Ilkeston and Scunthorpe Gas-Works, came before the Unopposed Bills Committee of the House of Lords last Tuesday.

Southend-on-Sea Corporation Bill.—The Local Legislation Committee of the House of Commons had under consideration last week this Bill, which, *inter alia*, provides for the incorporation of Leigh within the borough boundaries of Southend. There is no serious opposition to the scheme of incorporation, which will necessarily carry with it the amalgamation of the Leigh Gas-Works with the Southend gas-works undertaking.

New Gas-Works for Cleckheaton.

The new gas-works scheme at Cleckheaton was started last Tuesday, when Mr. J. Fenton, the Chairman of the Gas Committee, cut the first sod on behalf of the Urban District Council. The estimated cost of the works is £50,000; but for the present it is not considered necessary to add to the existing storage accommodation, and so it is thought the expenditure will not exceed about £40,000. The construction of the works will be carried out under the supervision of the Gas Engineer (Mr. A. L. Jennings); and a contract has already been made for the retort-house and an installation of Woodall-Duckham vertical retorts. The scheme also includes a railway siding from the Lancashire and Yorkshire Railway, which runs parallel to the site. Last week's proceedings were informal; but some short speeches were made, and the confident hope was expressed that the projected works will be successful. The present consumption of gas is about 130 million cubic feet per annum; and it is steadily increasing. The capacity of the new works will be 750,000 cubic feet per day.

Mossley Gas-Works Extensions.—In the course of a Local Government Board inquiry regarding an application by the Mossley Town Council for powers to borrow £2800 for gas-works extensions and renewals, it was stated that the amount included renewals in connection with the holder which was damaged by an explosion last August, when three men lost their lives. A sum of £650 has been paid in compensation to the next of kin of these men. Messrs. Ashmore, Benson, Pease, and Co. are to add a new lift to the holder in question.

Dry Gas-Meters for Birmingham.—There are about 90,000 prepayment meters at present in use in the area of the Birmingham Gas Department, and of this number it is estimated that no fewer than 70,000 are three-light wet meters. It is the intention of the Department to replace these with five-light dry meters in all cases where the quantity of gas consumed renders such a change desirable. Gas-fires and gas-cookers have become so popular that in the majority of instances the three-light meter is found to be too small in capacity to meet the full requirements.

LEGAL INTELLIGENCE.

WATER CHARGES TO LICENSED CATERERS.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, July 22.

(*Before Lords Justices* VAUGHAN WILLIAMS, BUCKLEY, *and* HAMILTON.)

Metropolitan Water Board v. Avery.

This was an appeal by the Metropolitan Water Board against a decision of the Divisional Court which reversed one given by the County Court Judge at Westminster in favour of the defendant. The proceedings in the Divisional Court were reported in the "JOURNAL" for March 25 last (p. 832).

Mr. CLAVELL SALTER, K C., who appeared for the appellants, said the question their Lordships had to determine was whether water supplied to a restaurant was water "supplied for the purposes of a trade or business, or whether it was water supplied for domestic purposes" within the meaning of section 25 of the Metropolitan Water Board (Charges) Act, 1907.

Mr. RYDE, K C. (for the respondents), remarked that what was called a "restaurant" was, in fact, an ordinary public-house which did a little luncheon business.

Mr. CLAVELL SALTER said the case raised a very large question, affecting a vast number of people, and it was unfortunate that it should have been raised over so small a business; but, of course, the principle to be settled would apply to all similar businesses, whether large or small. The defendant in the original action was the licensee of a fully-licensed public-house within the Metropolitan area, the "Crutched Friars," which had an ordinary unmetered supply of water. In addition to the public-house business, there was a restaurant business. Some thirty people came in every day, and were served with a meal. The Board treated the premises as trade premises, which involved an addition to the ordinary domestic use of water and which justified them in making a further charge. Under the Charges Act, they had to supply a dwelling-house by an unmetered supply, and premises used for trade purposes by a meter supply; and, where premises were used for both trade and domestic purposes, the Board could claim to supply wholly by meter with a certain minimum charge, or they might give two separate supplies. In the case of fishmongers, butchers, florists, photographers, and a great many other trades, it had been the practice of the Board to charge them a moderate sum in addition to the usual 5 per cent. on their rateable value for domestic purposes; and in this case it was half-a-crown a quarter for the extra water used.

Lord Justice BUCKLEY: Take a day school where there are (say) twelve boarders in the house and fifty boys coming in to be taught, would the Board regard the water used as not for a domestic purpose? What would they do legally in that case? Or if you had a factory which used no water at all, but, in point of fact, employed a large number of people who used water for lavatories and other things, would that not be a "domestic" purpose?

Mr. CLAVELL SALTER said certainly it would. The Act specified that where water was used for the purposes of any trade, it was to be deemed, for the purpose of payment, not to be a domestic supply; and the question here was whether the water was used for the purposes of trade. It had never been the practice of the Board, though it was of their predecessors, to make an extra charge to public-houses; and it was not until the Board ascertained that a restaurant business was being carried on in addition to the ordinary public-house business that they made an extra charge.

Lord Justice BUCKLEY: Do you contend, as a matter of right, that the Board could charge for the water which a man drinks with his whisky in a public-house?

Mr. CLAVELL SALTER: Yes, my Lord, I do; because that is not a "domestic" user for the purposes of charge. If water is supplied for reward in trade, it is water used "in trade." In the case of a school, the use of water was ancillary; the fact that the boys had to be boarded and lodged was ancillary to their schooling. The difference in the purposes had been very well illustrated in three decided cases relating to sanitary conveniences. It had been held in the cases of a gas-works and a ticket-printing works that water was not supplied for the purposes of trade, but was a domestic supply; while in the case of a railway, the Court had held that water supplied for lavatories for passengers' use was water supplied for the purposes of the railway. In each case it was a question of fact whether a material part of the supply was for use in trade; and the Act said that where water was used for any trade whatever, it should be deemed not to be a domestic use for the purpose of payment.

Wednesday, July 23.

Mr. CLAVELL SALTER continued his argument; and, after reading the judgments given in the County Court and the Divisional Court, he quoted several cases in support of his contention, which was that section 25 indicated the area of domestic purposes within or outside which every case must fall. He also contended that the present case was *ipso facto*, by express direction of Parliament, outside that area for the purpose of payment.

Lord Justice BUCKLEY: Is not the real question—Is not the water here supplied for domestic purposes "in" a trade?

Mr. CLAVELL SALTER said he did not care whether the water was or was not used in a trade, because if it was supplied for purposes of any trade it was not supplied for a domestic purpose. The Court must find out for itself what a domestic purpose was. The point upon which he wanted the decision of the Court was whether the Board had a legal right to charge in this case for a non-domestic supply.

Lord Justice BUCKLEY: Do you say, "I concede that the cooking and supply of food to a customer is a domestic purpose"?

Mr. CLAVELL SALTER: No; I say that the water is used in a trade to satisfy a domestic purpose.

Lord Justice BUCKLEY said the question in the present case was for what purpose the water was supplied, and was it a domestic purpose. The test was the purpose, not the character of the house. Did it follow that because the water was used to cook a meal for an outsider it was used for other than a domestic purpose?

Mr. CLAVELL SALTER: Yes; because it was used for reward by a person outside.

Mr. RYDE said the case before their Lordships was covered by express authority in the Court of Appeal; and he relied upon decisions already given. The question of domestic use could not depend upon whether or not the person using the water slept in the house.

Thursday, July 24.

Mr. RYDE was continuing his argument this morning, when

Lord Justice HAMILTON said that if Counsel relied upon previous decisions in the Court of Appeal and in the House of Lords, the Court were prepared to give judgment on the point argued.

Mr RYDE assented, and said he reserved any other point in case of eventualities.

Mr. CLAVELL SALTER having replied, their Lordships gave

Judgment.

Lord Justice VAUGHAN WILLIAMS said he had come to the conclusion that the appeal failed. The case was governed by authorities; but far from saying that, apart from them, and in particular the authority of the House of Lords in the case of Colley's Patents, he should have come to the conclusion at which he had arrived. He felt that the view obviously taken by Justices Bray and Channell in this case – that the matter was not absolutely clear and easy of decision—was right. His Lordship then reviewed the facts of the case, and read the judgments of the Divisional Court and of Lord Loreburn and Lord Mersey in the Colley's Patents case. In conclusion, he said the question of the proper construction of the Act of Parliament was not so obviously decided by the House of Lords as to make their judgment conclusive, because the House had deliberately limited the operation of the Act.

Lord Justice BUCKLEY said that in the Divisonal Court Mr. Justice Channell, in the course of his Judgment, said: "It is the trade use of water, and not the increased use caused by a trade or a domestic use of water, which was put by section 25 outside domestic purposes." With this sentence he agreed, and in these few words was contained the principle upon which the present case had to be decided. Looking at the Board's Charges Act, he found in sections 7, 8, and 9 certain provisions for the supply of water for domestic purposes, and in section 16 for the supply for purposes other than domestic. In section 32, the question of the supply of water for other than domestic purposes was dealt with; and, in this connection, section 25 was said by the marginal note to be one defining domestic purposes. When he read this section, it contained no such definition at all. What it did was to say that, for the purposes of the Act, certain uses should be domestic, and certain others non-domestic. In order to understand the section, he read it as if it ran: "In and for the purposes of this section, the expression 'supply of water for domestic purposes' shall be deemed to include the supply of water for closets, baths," and so on; and then the latter part of the sentence fell in quite properly—"but shall not include a supply of water for" (among other things) that which we have to consider—"any trade, manufacture, or business." So that, in dealing with the section, he had to look to see whether the supply of water had been for domestic purposes or for those which were not domestic; and, in that connection, whether it had been supplied for the purposes of "trade, manufacture, or business." It was quite plain, both upon authority and without authority, that what he had to look at for the purpose of this case was what was the character of the purpose for which the water was used, not what was the character of the premises in which it was used, nor that of the person using it. Upon the premises in question the business of cooking and supplying food was carried on, and the water was consumed for the purposes of cooking food, washing dishes, and other like purposes. Nobody disputed that these purposes were domestic; but the existence of the trade caused a larger demand for water for these domestic purposes. The question then was whether water supplied for the purpose of the trade of a restaurant keeper, when it was supplied to meet only an increased demand caused by the trade, was other than domestic. His answer was that it was not supplied for any trade. It was supplied to satisfy an increased demand for domestic purposes, which would not arise if the trade were not carried on; but nevertheless it was supplied for domestic purposes. A great many authorities had been referred to; but in all these cases the water was taken to be supplied for domestic purposes and not for the purposes of trade. The principle in the case of *Pidgeon v. Great Yarmouth Water Company** seemed to him to be entirely applicable to the present case. It was accepted by the framers of the Act of 1907; and he thought this governed the case. Here the simple test was, not whether the water was consumed in the course of trade, but whether the user of the water was in its nature domestic. The appellants sought to establish that every trade purpose, though it was domestic, was non-domestic. He thought this was erroneous. One must first see whether or not the user was domestic; and if it was found to be so, then the result was not altered by the fact that an increased demand for consumption of water was created by reason of the existence of trade. He thought the appeal must be dismissed.

Lord Justice HAMILTON concurred.

The appeal was accordingly dismissed, with costs.

The Darby and Gyde Bankruptcy.

In the High Court of Justice last Wednesday, Mr. Justice Phillimore had before him an application by the Official Receiver in the bankruptcy of Walter Darby and Harry Warwick Gyde (now in penal servitude under circumstances which will be in the recollection of our readers) for directions as to the disposal of a sum of £1900 which was payable to him as Trustee. The terms of the partnership between the two

* See "JOURNAL," Vol. LXXVIII., p. 1390.

bankrupts were that Gyde should take two-thirds and Darby one-third of the profits and losses. Assets to a considerable amount had been recovered by the Official Receiver in the bankruptcy of Darby, and these had enabled the liquidators in three of the companies in which he was concerned to pay off the liabilities. After this had been done there remained a surplus, part of which had given rise to the application. The point submitted to his Lordship was whether it should go to the separate estate of Darby, against which all the claims had been lodged, or to the joint estate. He decided in favour of the latter course, as the money represented partnership profits; but if, after the expiration of three months, no claims have been made, the amount will be divided in the proportions above indicated.

Action on a Coke Contract.

At the Edmonton County Court last Tuesday, the Enfield Gas Company sued Isaac Glassman, of Chicksand Street, Whitechapel, and J. Samuels, of Booth Street, Spitalfields, coal merchants, the former for £12 6s. 5d. and the latter for £14 6s. 7d., under agreements for the purchase of coke. Mr. Robb appeared for the Company, whose case was that each defendant agreed to buy 300 tons of coke at 18s. per ton, to be removed in monthly quantities. A deposit of £10 was paid by each, as a guarantee for the due performance of the contract. Glassman removed only 88 tons 15 cwt., and Samuels only 83 tons 15 cwt. The remainder was re sold by the Company at low prices—some at 15s. 10d. and some at 16s. per ton; and they now sought to recover from the defendants the difference, after giving credit for the deposits, which were forfeited under the agreements. The defendants alleged that the coke was unsatisfactory, and that, as a consequence, they had lost their trade. It was stated, on behalf of the Company, that large quantities of coke had been sold to nurserymen, and no complaints had been received from them. His Honour Judge Bray suggested that the Company should make an offer; but this was not done. He therefore ordered each defendant to pay two-thirds of the claim against him, with costs.

Claim against the Gaslight and Coke Company.

In the Shoreditch County Court, last Tuesday, before his Honour Judge Cluer, a settlement was arrived at in the Workmen's Compensation Act claim of Annie Martha Littlechild, of 96, Chalgrove Road, Hackney, against the Gaslight and Coke Company for the death of her husband. Deceased was wheeling a truck at the Haggerston station of the Company, when he fell into a coal-store, and was killed instantly. The accident occurred on the 10th of May last; and the respondents immediately let the widow have £5 pending an inquiry into the amount of compensation they were liable to pay under the Act. They had now agreed that the average earnings of the deceased were £300, and that his widow was entitled to this sum; and the balance (£295) had been paid into Court. There were four children living, all of whom were dependent, or partly, on the deceased; so his Honour decided to apportion £200 to the widow and £100 between the children—remarking that they were all well on in years, and would not need much to keep them until they could support themselves. He granted her £30 down, to pay the funeral expenses and borrowed money, and £4 a month. The Solicitor for the applicant asked for costs, as he said the respondents did not pay the money into Court until after arbitration proceedings had been started. His Honour granted costs up to the date of paying in.

Rating Appeal by the Bristol Water Company.

At the Bristol Quarter Sessions last Tuesday, the Recorder (Dr. Blake Odgers, K.C.) delivered his reserved judgment in an appeal by the Bristol Water Company against the rating of the workhouses and other premises of the Bristol Guardians. It was against a rate made on April 1, 1911, and was in respect of the separate assessments of Eastville, Stapleton, and Southmead Workhouses and the Children's Homes. The original assessment of all combined was £3286, subsequently raised, on a special valuation by the late Mr. Henry Williams, to £8587. But the appellants contended that this should be increased to £14,530—the figures of the valuation of Mr. Peter Addie. The respondents' Counsel said they were content to abide by the present valuation of £8587. The appellants, however, submitted that this figure did not represent the true value of the properties; hence their desire to have it raised to the larger sum. The Recorder, in giving judgment, referred to the facts put before him in evidence, and said the net result of his dealing with the four properties in dispute was that he found Mr. Williams's figures were substantially correct, and alterations he had made in them had been to reduce rather than increase them. As to costs, he ordered the Water Company and the Guardians to pay their own. He also directed that the Guardians should pay to the Overseers the reasonable costs they had incurred in the appeal, and that the rate of 1911 should be amended in accordance with his figures, but not that the rate should be quashed.

Unprofitable Electricity Supply at Kingston-on-Thames.

A local correspondent writes: The Engineer's report to the Electric Light Committee of the Kingston-on-Thames Corporation for the year ending the 31st of March is sorry reading for the ratepayers. Owing chiefly to the abnormal rise in the price of coal, the report states, a net loss of £1254 has resulted from the working for the twelve months under review. This loss is equivalent to a rate of 1½d. in the pound. The balance-sheet shows that the loss for the preceding year was £59 11s. 2d.—the smallest deficit for five years. Great economies are expected from the installation of a Diesel plant in course of erection; but the burgesses will be well advised not to be unduly optimistic, for an increase in the price of oil fuel is a factor to be considered in forecasting favourable results. The outlook for the ratepayers is not a hopeful one. They can only wait in patience, and meanwhile be thankful their municipal enterprise is confined to the supply of electricity, which since its commencement has resulted in a total loss of £16,529.

MISCELLANEOUS NEWS.

CO-PARTNERS AT THE CRYSTAL PALACE.

A System that has been Tested, and Not Found Wanting.

The only effect of passing years on the system of co-partnership appears to be to still further demonstrate its capability of doing just that which it was intended to accomplish; and thus one is not surprised to find that, as opportunity occurs, it is warmly praised by all employers and employees in the fortunate position of enjoying its benefits. One of the opportunities, which is always enthusiastically seized upon for this purpose, is the annual Co-Partnership Festival in connection with the schemes of the South Metropolitan and South Suburban Gas Companies. This event took place at the Crystal Palace last Thursday; and of it one may say that it was fully as successful as its predecessors. For the thorough enjoyment of a day at the Crystal Palace, good weather is necessary; and in this respect the co-partners were lucky, as usual, for they were favoured with what has become almost a rarity—a real summer's day. It was a happy party—all evidently on good terms with themselves and each other—who assembled for dinner, on the invitation of the Directors of the two Companies, in the grill room at Lyons' Restaurant. The guests were the Co-Partnership Committee, some of the foremen, and a number of other employees—the wives being also invited. On the present occasion, the number of co-partners eligible to be present was considerably greater than previously, owing to the amalgamation scheme carried into effect by the South Suburban Gas Company, which resulted in the addition of some 300 names to the co-partnership roll of that Company. The opinion has from time to time been expressed in certain quarters that co-partnership is not applicable to all occupations; but whether or not this is the case, the principle is making steady strides in the gas industry, and it is really a pity that some of the unconverted could not have been present to hear the speeches last Thursday. Perhaps, however, they will do the next best thing—that is, read them. They will learn that co-partnership is a business proposition, and that the employees fully realize this fact, and act up to the knowledge. Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Company, occupied the chair, and was supported by Mr. Charles Hunt, the Chairman of the South Suburban Company, members of the two Boards, and a number of the chief officials of both undertakings. After the Loyal Toast had been honoured,

A Beloved Memory.

Mr. Charles Carpenter said the next toast was one without which no meeting of this kind would be complete. It was a toast which for several years past they had honoured; and he was sure they would not wish that day to be an exception. He asked them to drink to the memory of the founder of their co-partnership scheme. The late Sir George Livesey, as most of them knew, spent the last twenty-five years of his life in what might be termed preaching the gospel of co-partnership up and down the country; and it was satisfactory to know that during his last years he was rewarded by the knowledge that many of those who had for a long time turned a deaf ear to his teaching became converts to the principles which he inculcated. Many men occupying a similar position, and blessed with the means and the unusual ability which Sir George possessed, would have felt justified either in passing a life of leisure or in satisfying their ambitions by the acquisition of power or money. But Sir George gave himself up to do what he could to ameliorate the condition of those with whom he had passed so many years of his life, and whose claims to a larger share in the world's goods had been put on one side or ignored by so many people. To-day they had the evidence of his good work. They knew that co-partnership was spreading slowly but surely through the land; and they knew that in the case of the Companies who were represented in that room it had been an enormous success. This being so, he would ask them all to rise in their places, and silently drink to the memory of the great and good man who did so much to achieve the result which they were enjoying now.

The Objects of Co-Partnership.

Mr. Charles Hunt (after expressing the regret of two members of the South Suburban Company's Board, Messrs. Light and Boraston, at not being present) said he regarded it as a great privilege to once more have an opportunity of proposing what might be called the toast of the day. On the present occasion he proposed it with special satisfaction, because the undertaking which he had the honour to represent had been the means during the past year of adding considerably to the number of the co-partners. The South Suburban Company were present that day as three undertakings rolled into one; and they had evolved in the process very nearly 300 additional co-partners. When this fact became evident, it was a question as to how the additional representation of this larger number was to be accommodated at these functions; and he wished to acknowledge the very generous way in which Mr. Carpenter met them when the matter was first broached. He kindly offered to reduce the representation of the South Metropolitan Company, so as to increase that of the South Suburban Company. This offer, however, could not be accepted. The two Secretaries therefore put their heads together, and consulted the Palace authorities, with the result that a much better room had been provided; and he was very glad to see it so well filled. A large number of those present were more or less veteran co-partners; and the objects for which co-partnership was founded, and the great advantages which it afforded,

were, of course, familiar to them. There were, however, some who were new co-partners, to whom these objects and these advantages might not be so familiar. To these he would say that Sir George Livesey founded this co-partnership scheme for three specific objects. He sought by it to counteract the indifference which unfortunately characterized many workmen of the present day. He endeavoured to secure by it the goodwill and the cordial co-operation of all employees in promoting the welfare of the undertaking. Lastly, he sought to find in it a means by which co-partners could lay by for themselves something for a rainy day, or establish themselves more or less in a position of independence. He thought they might fairly claim that all three objects had been well attained. By this he did not mean to say that there were not at the present time still a few indifferent workmen; but he did say that their numbers were very much fewer, and he saw no reason why in course of time co-partnership should not completely eradicate them. They knew that they had secured the goodwill and co-operation of all co-partners in the conduct of the business. It was a pleasure to be able to testify by his own personal experience in the matter during the past few years; and he would point to the progress of the South Suburban Company as evidence of the fact. When this co-partnership scheme was established—in, he thought, 1894—the Company were charging for gas 2s. 9d. per 1000 cubic feet, whereas to-day the price was 2s. 3d., with coal at a much higher price than it had ever been during the last ten years. He did not, of course, mean to say this was entirely due to co-partnership; it would be wrong to do so. But he did claim that co-partnership had had a very large share in the work. Then they came to the third object—the laying by for a rainy day, or for securing a certain degree of independence. His Company's co-partners to-day owned something like £44,000 of stock, in addition to which there was a considerable sum of money in the hands of the Company, which brought up the total of the men's savings to about £50,000. The number of co-partners having a holding of £100 and upwards was steadily increasing. He knew how hard it was to save on a scanty earning; and he did not want to preach what he was not called upon to practise. But he would like to say that co-partnership offered the easiest possible means of saving money, because it gave the men, in addition to their wages, something which they could lay by, and which was bound to accumulate from year to year so that in course of time it amounted to a very respectable figure. He had often marvelled at the perseverance of Sir George Livesey, and the solicitude with which he watched over the first few years of this movement; how he held on to his course unmoved by outside indifference and chilling criticism. Now they found that co-partnership had the sympathy of thoughtful men of all parties and all ranks, as the one solution of labour difficulties. It had found a place at last in the programme of the leading Association of the British Isles – he meant the British Association, before which body Mr. Carpenter was to read a paper on co-partnership next September. In his propaganda, they all wished Mr. Carpenter success. He had great pleasure in proposing the toast of co-partnership.

Good Wishes.

Mr. Charles Carpenter said he had received a telegram from Mr. Henry Austin, who had been for many years one of the most earnest advocates of co-partnership. The telegram read: "Regret unable to join the gathering. My mind is with you. Wishing all good health, happiness, prosperity, and success to co-partnership." Knowing Mr. Austin as he did, and having a high regard for him, which he shared in common with all co-partners, and having heard that he was not at all well, he thought it would be very gratifying to him if they sent him a little reply in the same way. He suggested: "Co-partners assembled at the Palace to-day welcome your cordial greeting, and hope another year to have you with us." Unfortunately, some of the Directors of the Companies were unavoidably absent; but he would ask Mr. Rostron (the junior member of the South Metropolitan Company) to make some remarks, and after that Mr. Alexander Dickson, the late Chairman of the Bromley Gas Company (who occupied a similar position, if he might say so, on the South Suburban Board).

[A Coin with Two Heads and No Tail.

Mr. L. W. S. Rostron said that if there was one subject on which he was always ready to speak when he could get anyone to listen to him, it was the subject of co-partnership, because he looked upon it as being absolutely the best thing in the world. It was often said that there were two sides to every question. With this he quite agreed as a general rule; but he had never yet been able to find the reverse side of co-partnership. He looked upon it as being a coin with two heads and no tail. A good deal was heard nowadays about social reform; but did they ever hear of any scheme of social reform which was fit to hold a candle to co-partnership? First and foremost, it brought employer and employed together, and tended to restore the human relationship to the want of which he believed was due more than to anything else the industrial troubles of which so much was heard at the present day. It enabled them to know one another. It was the outward and visible sign of a common bond of interest which existed between them. This was undoubtedly co-partnership's greatest advantage. Secondly, he thought that it led to pleasanter and more efficient work. It rendered co-operation between the different branches very much easier, and made everything more interesting; and work of this character was very much more pleasant for those who had to do it. Co-partnership made for better working, and this was the way to safeguard the industrial supremacy on which the welfare of the country depended. Lastly, it afforded a ready means of saving, and a safe means of investing savings. This was one of the greatest blessings that could be conferred upon the labouring classes of the country. These three things, all of which were very important, co-partnership did, and without any corresponding disadvantages—without any additional taxation, and without the appointment of a single additional public official.

Some Further Testimony.

Mr. Alexander Dickson remarked that there were two prominent characteristics in connection with this anniversary. First, there was the memory of the founder of their co-partnership; and, secondly, their interest in it. No one could entertain a more reverent respect than he did for the memory of the founder of co-partnership in the gas industry. All honour to that valiant soul, he said, whose courage crowned his faith, and vanquished obstruction insurmountable to many others. Knowing the author, and having interests and responsibilities in kindred undertakings, he (the speaker) was naturally greatly attracted towards the scheme of co-partnership. During his chairmanship of the Bromley Gas Company, the question often received much careful consideration, and but for the difficulties attending its initiation under the circumstances of the day, the personal preference of his colleagues and himself would have led them to adopt the precedent of the larger Companies. And he might tell them now that, in the negotiations which eventuated in the recent amalgamation, the fact that the South Suburban Gas Company had already adopted co-partnership, and also established a solid superannuation fund and an accident fund, had great weight with himself and his colleagues. He could say that no more potent bond of union existed than community of interests among allies. This was obvious from family ties and associations, as well as from political combinations; and he was pleased to-day to supplement the observations of the Chairman by saying, after close inquiry, that the work of the last twelve months in the districts of the added undertakings had exemplified in a most gratifying degree the deeper inspiration to best efforts which this community of interests had engendered equally among the new as among the old members enrolled for the co-partnership benefits. It was his privilege to live in the area of the South Metropolitan supply; and he would like to bear testimony to the beneficial effects, which were obvious to those who observed details, in the work of the Company. He could testify to the promptness, to the intelligent investigation, and to the smart activity of their people in any work they might have to do. There was a perfection of service only attainable where the workers were themselves profiting by their own excellence and faithfulness. Sobriety and thoughtfulness found a splendid incentive in the distribution of that £600,000 among the Company's workers through this co-partnership; and thrift was well exemplified in that £350,000 of bonus stock in the Company which stood in the names of the beneficiaries of co-partnership—more than one-half of the total sum which had been distributed. The South Suburban Company's figures were naturally smaller. As one coming in to share in the enthusiasm with which they were all working under this co-partnership scheme, he did most heartily congratulate them upon their present advantages, and he congratulated also the large number who had come in this year as new members on their good fortune. He was aware, from his own personal knowledge, that they appreciated it very highly; and he was confident that the services they would render would constitute irrefutable proof of the wisdom and justice of co-partnership principles.

Some Remarks by the Officers.

Mr. W. Doig Gibb, the Chief Engineer of the South Metropolitan Company, said when they read about co-partnership as proposed in different firms in this country, they could not but be struck by the fact that co-partnership was a word that might mean different things. But he was quite certain they at least had got hold of the real co-partnership, because it was not possible for him to go round and come in contact with foremen and workmen, and find the community of interest which existed, without realizing to the full that they must be partners in a common cause, and a cause which they thoroughly believed in. He said co-partnership might mean different things; and an expression used by a previous speaker made him think that other words also meant different things. Reference had been made to community of interests among allies; and this, of course, was meant to be that they were all co-partners, and firm friends. But at this particular time of the world's history, he had no doubt they could cast their thoughts on some allies who did not seem to have community of interest. Instead of this, they were grabbing all they could get, and not thinking of others who were their former friends. Co-partnership could not exist under such circumstances. A man must not think of himself; he must think of all. He must think of the undertaking as a whole, and not of himself individually.

Mr. S. Y. Shoubridge, the Chief Engineer of the South Suburban Company, remarked that he would like to say to those who were present for the first time, and who belonged to his Company, that co-partnership could not continue to prosper without all co-partners working very hard for it. It was not a self-acting automatic arrangement which produced only benefits. Success was only obtained by the hearty co-operation and pulling together of all the members. If the new members would realize this, as he believed the old ones in both Companies did, the successful future of co-partnership was assured. He wished to express on behalf of the employees of his Company their gratitude to the Directors for the excellent entertainment provided, and for the opportunity afforded of meeting their friends of the South Metropolitan Company.

Mr. W. Wastell, the Secretary of the South Suburban Company, expressed his pleasure at being, as a very young co-partner, afforded an opportunity of voicing his deep and heartfelt gratitude to the many co-partners in the Company who had worked so loyally with him during the few months that had elapsed since he came to Sydenham. Though he arrived as a stranger, he soon found himself among staunch friends. He said from the bottom of his heart, "God-speed co-partnership, and particularly the schemes of the two Companies who are represented here to-day."

Mr. F. M'Leod, the Secretary of the South Metropolitan Company, said he was particularly anxious that they should not think only of the benefits of the scheme and overlook the obligations. This was a point that had been brought out by several speakers. They must not regard it as though it were a right, but remember that something was expected from them in return. Each must do his share if the success of co-partnership was to be assured.

Expressions of Thanks.

Mr. H. Clouder, of the South Metropolitan Company, proposed a vote of thanks to the Directors for their kind hospitality, and said he desired to express on behalf of his fellow co-partners their hearty appreciation of what had been done for them and was being done for them at the present time. They cordially welcomed the new members who had been enrolled by the South Suburban Company.

Mr. W. T. LUTHER, of the South Suburban Company, seconded the vote, and remarked that in 1894, when the bonus started, the price of gas in his Company was 2s. 9d. per 1000 cubic feet. This enabled them to have a 3 per cent. bonus; and only in one year did they have to go below this amount. This was in 1901, when the price of gas was increased. He was pleased to say that this year they received 7½ per cent., which was the largest bonus so far paid by their Company. If they all continued to do as they had done in the past, he believed they would in the near future be able to beat the South Metropolitan Company, whose bonus was 8¼ per cent.

Mr. WALTERS, of the South Metropolitan Company, and Mr. CARTER, of the South Suburban Company, supported the vote; the latter remarking that it should include their thanks to Mr. Carpenter for presiding.

AND A SUGGESTION.

Continuing, Mr. Carter said his faith in co-partnership was unabated; and he hoped it would continue to grow. In connection with this matter, he suggested that it would be fitting to send from the gathering a fraternal greeting to their great neighbours the co-partners of the Gaslight and Coke Company, who had not only emulated their own Companies by introducing co-partnership, but in the institution of an annual celebration at the Palace.

The vote was carried amid hearty applause, and

Mr. CHARLES CARPENTER, after acknowledging the vote, said he would collaborate with Mr. Carter in preparing the message which he was sure it was the unanimous wish of all present should be sent, as had been so happily suggested, to their co-partners on the other side of the water. [Applause.]

On reaching the grounds, photographs were taken, and the party then dispersed to spend a happy afternoon in the grounds—returning later to the restaurant for tea.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

The Directors of the Brentford Gas Company, in their report for the six months ended the 30th of June, which will be presented at the half-yearly meeting on Friday, state that the accounts show a sum of £129,367 available for distribution. They therefore recommend the declaration of dividends at the rates of 5, 14, and 11 per cent. per annum, subject to income-tax, on the preference, consolidated, and new stocks. The Directors deeply regret to report the death of their late valued Chairman, Mr. Ulick John Burke, which took place on the 12th of March. They say: "Mr. Burke had been a Director of the Company for twenty-seven years, and its Chairman during the last six years. By his death the Company has been deprived of the services of one of its most experienced and able administrators, and his colleagues and the staff of the Company of a kind and sympathetic friend." In pursuance of the Act of Parliament, they have, as already announced in the "JOURNAL," elected Mr. William Mann, the late Secretary of the Company, to the vacant seat on the Board. A resolution will be submitted to the proprietors authorizing the Directors to raise a further sum of £100,000 of new stock, 1881, which will be required to meet the increasing business of the Company.

The accounts accompanying the report show that the revenue from the sale of gas amounted to £199,808; from the rental of meters, stoves, and fittings, to £29,736; and from the sale of residual products, to £60,260—the total receipts being £289,854, as compared with £269,817 in the first half of 1912. The expenditure on the manufacture of gas was £152,384; on distribution, £43,229; and on management, £9482—the total expenses being £225,970, as compared with £211,563 in the six months ended June 30, 1912. The balance carried to the profit and loss account is £63,884, compared with £58,254 this time last year.

The working statements show that, under the supervision of Mr. Alexander A. Johnston, the Engineer and Manager, 98,251 tons of coal and 1,403,989 gallons of oil were used in the past half year in the production of 1,786,089,000 cubic feet of gas (including 606 million cubic feet of carburetted water gas), of which 1,669,454,000 cubic feet were sold and 1,698,204,000 cubic feet were accounted for. The estimated production of residuals was: Coke, 61,438 tons; breeze, 7925 tons; tar, 1,221,954 gallons; ammoniacal liquor, 29,433 butts.

EUROPEAN GAS COMPANY, LIMITED.

Good Expansion in Business—The Strike at Nantes.

The Ordinary General Meeting of the Company was held last Tuesday, at Finsbury House, Blomfield Street, E.C.—Mr. R. HESKETH JONES, J.P., in the chair.

The SECRETARY (Mr. W. B. Brady) read the notice convening the meeting; and subsequently the report of the Directors and the accounts. The report was as follows:

The increase in the sales of gas has been 2·68 per cent.; and the increase in the number of consumers is 6377.

The amount paid on account of pensions during the year was £12,143, equal to 1·54d. per 1000 cubic feet of gas sold.

The efficiency in the manufacturing and distributing plant at the several stations has been fully maintained; and, having regard to the extension of the Company's business at Rouen, the Directors have deemed it advisable to acquire further land there, with river frontage, adjoining the works.

The average length of the Company's concessions is now 28 years.

The Stock Exchange values of the investments on the Company's balance-sheet on the 31st of March last are quoted as being £19,601 below the amount at which such investments appear on the Company's books; but as many of these securities are repayable at a fixed date at par, it is unnecessary, in the opinion of the Board, to write them down below the sums at which they now stand, and which, in most cases, are considerably below par value. Further, there is a special reserve available for the depreciation of securities amounting to £12,219.

The Directors regret to report that they have had to contend with labour troubles at Nantes. The Company's works were effectively protected by the local authorities during the strike; and, with the assistance of a number of men who remained loyal to their engagements, together with stokers obtained temporarily from the other stations, the Company were able to maintain a full supply of gas, and bring the struggle to a successful issue.

The profits for the year are sufficient to maintain the usual dividend of 20s. per share, free of income-tax (of which 10s. was paid on Feb. 1), and to add £301 to the amount of undivided profits. The remaining 10s. will be paid on Aug. 1.

The Directors who retire by rotation are A. T. Eastman, Esq., and Henry C. Smith, Esq., and the retiring Auditors are J. Reeson, Esq., and H. J. Luff, Esq., who, being eligible for re-election, offer themselves accordingly.

The CHAIRMAN, in moving the adoption of the report and accounts, said the first paragraph of the report pointed to the increase of revenue in the sales of gas, and to the increase in the number of consumers, which showed satisfactory progress. He might add that the mileage of mains during the year had been increased by 14; making the total length of mains through which they passed their gas 592 miles. Regarding the apparently small increase of 2 68 per cent. in the sales of gas, their managers alluded to the cold and wet weather of last summer, which seriously affected the seaside towns supplied, especially Boulogne, where the usual number of visitors was considerably reduced. In that town the increase in the sales of gas was only 1¼ per cent. on those of the previous year; but he might add that, during the past thirteen years, the consumption of gas there had doubled. At Havre and Nantes, the gas-rentals increased by 5¼ and 4½ per cent. respectively. At Rouen, the gas-rental had been reduced by 4¾ per cent.—due to the reduction of the sale price of gas; while the gas sold had increased by 7¾ per cent. The total quantity of gas sold showed an increase of 4¼ per cent. over the previous year. Looking at diagrams which had been prepared showing the course of their business, one saw progress at all the stations, excepting little Bolbec, which practically remained stationary. The second paragraph in the report alluded to the Company's payments last year for pensions—viz., a little over 1·5d. per 1000 cubic feet of gas. The third paragraph stated that all the manufacturing and distributing plant was in good condition, and that the Company had purchased land at Rouen, to which he would again refer presently. In regard to Stock Exchange values, the report stated that the investments on the Company's balance-sheet at March 31 last were quoted as being £19,601 below the amount at which such investments appeared on the Company's books; but as many of these securities were repayable at a fixed date at par, it was unnecessary, in the opinion of the Board, to write them down below the sums at which they now stood and which, in most cases, were considerably below par value. Further, there was a special reserve available for the depreciation of securities, amounting to £12,219. Of course, the values of investments were variable; and lately he tested them and found the book values were only 2s. 4½d., or less than ⅛ per cent., below Stock Exchange quotations. He also looked into the dealings by English gas companies; and, with one or two exceptions, where the investments had been reduced to Stock Exchange quotations, some companies set out their investments at cost price, while others were quoted at prices much exceeding their present realizable values. The balance-sheets showing investments at cost price met with the approval of official auditors. The next paragraph in the report was not a satisfactory one. The Company's men at Nantes some four years ago accepted an arrangement which fixed the rates of pay and conditions of labour until May, 1914. Disregarding this agreement, a section of the staff endeavoured to impose on the Company entirely different terms; and the Board's refusal to accept these induced a considerable number of the men to abandon work. M. Gustave Gautier, their Manager at Nantes, had at the time scarcely recovered from a very serious and dangerous illness; but he resumed his duties at once, and, as stated in the report, the Company were able to bring the matter to a successful issue. The strain, however, on the enfeebled health of M. Gautier had led him since the event to tender his resignation, which the Directors accepted, having in view the future interests of the Company. M. Gautier had retired on a pension, which the Directors trusted might be enjoyed by him, in better health, for many years to come. Following on this retirement, certain changes had been made in the management at Nantes, Rouen, Caen, and Amiens, which the Board believed would prove to the advantage of the Company. With reference to the accounts, he would first deal with Rouen. At last year's annual meeting, the Directors' report contained the following paragraph: "After protracted negotiations, the Directors have pleasure in reporting that they have secured an extension of the Rouen contract until 1946." As the mains at Rouen become the property of the Municipality at the end of the Company's concession, they had to purchase the user of them for the extended period of the concession. This cost £16,000; but the Company had £122,286 standing to the credit of undivided profits. The Board therefore debited this direct with the £16,000, in preference to leaving the item to be dealt with year by year until 1946. The report this year stated that, having regard to the extension of the Company's business at Rouen, the Directors had deemed it advisable to acquire further land there, with river frontage, adjoining the present works. It was very desirable indeed that the land, which covered about 3 acres, should not pass into the possession of others. The redemption account now stood at £514,055, or 51¼ per cent. of the £1,002,180 share capital of the Company, and was represented, by the Stock Exchange values of the investments—£521,727. During the year, the Board had placed to capital outlay £16,050 for new gasholders at Amiens and Sotteville, and other extensions, in addition to the Rouen land already referred to. Looking to the future, one ought never to prophesy. The cost of coals this year would be somewhat higher than during the past one; but if the profits should not amount to the sum required to pay the usual dividends, they had undivided profits amounting to some £107,000 to meet any temporary diminution in the profits. The ordinary dividends could therefore be maintained.

The DEPUTY-CHAIRMAN (Mr. H. E. Jones), in seconding the motion, said the shareholders had had the full facts of the position laid before them so lucidly by the Chairman, that it really left little for him to

say. The shareholders had no doubt been interested in hearing of the melancholy strike, which, although the Company came through it quite successfully, was a most unwarranted attempt not only to dictate the wages to be paid for labour, but the terms practically of the management of the undertaking. He was sure the shareholders would join with the Directors in feeling the greatest regret that old servants of the Company should have been not only misled by violent agitators, but that in the end they should have found themselves out of employment, and out of the enjoyment of those pensions and other privileges which the Company so carefully looked after for their old servants and for the staff of workmen, and which, as the Chairman had said, annually cost the Company 1½d. per 1000 cubic feet—an amount considerably larger than that provided for the purpose in the accounts of any English gas company. The Chairman had referred to the reserves. They were to be repaid—many of them at their par price; and unless they knew for certain that they would have to sell them in the meantime (which was not likely to occur in the happy circumstances the Chairman had disclosed), it would have been foolish to write them down. In regard to the new works, it was a great gratification to him to think that the Chairman and himself had worked together now as old gas managers for some years, and that during this period steps had been taken to bring their whole plant and practice up to the highest state of efficiency, which meant a good deal under the standard of the Chairman and himself; for they were connected with companies in England which were now realizing the highest results from their manufacturing operations. English companies were searching closely for every source of profit; and the shareholders of this Company would be glad to know that the same apparatus and the same methods had been gradually introduced into the operations of their own stations. This being so, they would hope to be some day on absolutely level terms with the best results obtained in England.

The motion was unanimously carried.

The CHAIRMAN moved, and Mr. R. S. GARDINER seconded, the confirmation of the interim dividend of 10s. per share paid on Feb. 1 last, less 6d. per share for duty in respect of all shares held in France, also the declaration of a final dividend for the year ended March 31 last at the rate of 10s. per share, free of income-tax, subject to a deduction for French stamp and transfer duty of 6d. per share in respect of all shares held in France.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, the retiring Directors (Mr. A. T. Eastman and Mr. H. C. Smith) were re-elected.

Moved by Mr. ALFRED BEVIS, and seconded by Mr. H. D. ELLIS, the Auditors (Mr. J. Reeson and Mr. H. J. Luff) were re-appointed, at the same remuneration as before.

The CHAIRMAN moved a vote of thanks to the London staff, and particularly to the Managing-Director (Mr. W. Williams). In his hands, they all felt perfectly safe. He understood the business in its every detail. He had been brought up in it; and it was, so to speak, a creature of his own. Their friend and Secretary (Mr. Brady), who was a good French linguist, had been with them many years; and he and the staff were very efficient indeed in their duties. Their officers on the Continent, he (the Chairman) had not had the pleasure of visiting lately, owing to an accident he met with in the Company's service three years ago; but the Deputy-Chairman could speak about them from personal intercourse better than he was able to do. From the correspondence they had with them, however, he (the Chairman) knew they had men who were thoroughly at heart with them, and who had the interests of the Company at their fingers' ends. Just at the present time, they were shifting their officers round a little; and he had no doubt the result would be still better success.

The DEPUTY-CHAIRMAN, in seconding, said that to those shareholders who came into contact with Mr. Williams, Mr. Brady, and the efficient staff surrounding them—men of years' standing—this resolution required very little commendation. The work of the Company in its financial and administrative part was conspicuous for its completeness. It gave him personal pleasure to second the vote of thanks to these earnest, faithful, and able gentlemen, with their staffs and rank-and-file, who were looking after the Company's interests on the Continent. He could assure the shareholders that, even though he paid them almost surprise visits, he invariably found all the men at their posts, and all bright and eager. They had a little table of comparisons between the stations prepared by Mr. Williams (as it was by his predecessor, Mr. Backler); and the interest their officials at each station took in knowing exactly how the other stations stood in respect of the smallest details—the gas and coke and other residuals made and sold, the leakage, and so on—showed their anxiety to come out the best. It was surprising to see how they looked after the *débris*, so to speak, of the works. Nothing was to-day wasted on a gas-works. Even the old fire-clay material was made into "grog" for use in the new material; and what was at one time waste and a nuisance was now turned into profit. All these small points were looked after at all their stations with ability and care. In addition to this, their officers were all men of good standing. They held excellent positions in their towns, and were men of self-respect, high courage, and education. In respect of the strike at Nantes, it was perfectly marvellous how well it was tackled by the co-operation of the managers—not only in the town itself, but from the other stations. They all put their shoulders to the wheel; and the Directors recognized it. It would, indeed, have been a most unfortunate thing if the strike had terminated differently. The Company would have been placed in the hands of outside authorities—not only in the matter of pay, but in other ways. But this was averted by the intelligence and zeal of their officers and staffs; and the highest praise that could be given to them was due to them. The Board took care to reward not only the staff, but the loyal men who worked for the Company during a most anxious time. He trusted they thought the reward was liberal; it was not, at any rate, above their merits.

The motion was heartily carried.

Mr. WILLIAMS, in responding for himself and all concerned, thanked the Chairman and Deputy-Chairman for their kind remarks and the shareholders for their cordial endorsement. Regarding the management abroad, the shareholders would understand that the duties of a gas manager did not become easier as time went on. They had all to face, more or less, greater labour troubles and difficulties; and the men had to be dealt with not only firmly, but with a great deal of consideration. Then, as the Deputy-Chairman had mentioned, they had to look out for every possible means for economizing. They were compelled to do this, for one reason because coal was at a very high price. But their managers had these matters fully under consideration; and he felt certain as the result the Board would still be able to place before the shareholders satisfactory financial statements.

Mr. H. A. RIGG, K.C., moved a vote of thanks to the Chairman and Directors. In doing so, he said that he had not been present at the meetings now for some years; but when he did come, it was always with the greatest possible pleasure. While there, he always looked at their books to see the nature of their investments, because he looked upon these as most important, as a protection in the event of anything happening. He saw their investments were all what he should call gilt-edged. There was a point he should like to emphasize. He thought they were very lucky in having Directors on the Board who went continually to France. In manufacturing businesses, as in farming, "the master's foot is the best manure." [Laughter.] When men like their Deputy-Chairman (who was a first-rate gas engineer, and up to all that was latest in gas) went to their various stations, he could see exactly how things were going on. If he could not, then he must have misled a good many Parliamentary Committees, because they had always the greatest confidence in what he said.

Mr. H. D. ELLIS, in seconding, remarked that, in the olden times, the duties of a gas director of a prosperous gas company were not what one might call exhausting. But *tempora mutantur;* and year by year the responsibilities and anxieties of a Board such as their own increased almost in mathematical progression—if not in something stronger. Every business man in these times had to be on the alert, so that his rivals did not get the better of him. There was also the constant dearness of material—coal, oil, and iron—which made it harder and harder to show the profits to which they had been accustomed. Last of all, there was the unfortunate tendency to have trade disputes. All these things went to make the work and anxieties of a gas director considerably more arduous. He only referred to these matters to emphasize how much more than ever the thanks of shareholders were due to their Board, as well as, on this occasion, their sympathy for having had to go through so much trouble. In spite of these things, they had given the shareholders a good report.

The CHAIRMAN, in replying for himself and his colleagues, observed that the fact that the resolution had been proposed by an eminent King's Counsel, and seconded by a man of such experience in gas affairs as Mr. Ellis, afforded the members of the Board much gratification. It had been a great pleasure to him to be present that day to hear this acknowledgment; and, on behalf of his colleagues and himself, he sincerely thanked the shareholders.

BAHIA BLANCA GAS COMPANY.

In moving the adoption of the report [*ante*, p. 254] at the meeting last Thursday of the Bahia Blanca Gas Company, Limited, the Chairman (Mr. J. C. im Thurn) said the result of the working for the year ended Dec. 31 last showed a debit of £1529, which they had been unable to avoid. At the same time, he did not think such a circumstance was likely to recur. Since the formation of the Company, they had had to contend against a series of years of bad harvests caused by drought, which had had the effect of stopping the growth of the city of Bahia Blanca. This condition of affairs was not likely to be normal, and when it changed they might look for rapid developments. The high price of coal and freight was a further cause of the poor result of last year. It was somewhat venturesome to hazard an opinion as to the future course. But there were signs of easier conditions; and it could be seen that the costs for the current year would be lower than those of 1912. A further reason which bore its part in the slow development of the business was the intense competition experienced from the electric light. Nevertheless, the Directors felt confident of being able to hold their own, though it might reduce the profits. They must hope an arrangement might be possible between the Companies. The total receipts from all sources came to £25,649, or an increase of £3654 over the previous year, which in itself was a satisfactory advance. Expenditure, on the other hand, was £27,179; being £5648 over that of the previous year—chiefly owing to increase in cost of coal and freights. Calling attention to various items, he said rates and taxes showed an increase of £238, caused by a resolution passed by the Municipality in 1912 to tax the Company for the use of the subsoil, and to impose a tax upon renewing special new wood pavement. The Company lodged a strong protest against the imposition of these taxes; and, after protracted negotiations, they had been successful in getting them removed for the future, so that this charge should not be experienced again. Bad debts showed an increase of £332. Acting upon the advice of the Auditors in Bahia Blanca, the Directors had made this provision against bad debts incurred during the times of the late bad harvests. Accounts had been kept on the books, in the hope that there might be a chance sooner or later of obtaining payment; but as from time to time consumers left the town, it became necessary to deal with the matter. The income from gas sales was £19,506—an increase of £1703, which was a distinctly encouraging improvement. Residuals also contributed £4674; being an increase of £1445, which favourable result had been obtained by careful regulation of the prices by the Manager (Mr. A. M. Hunter) in accordance with the fluctuation of the local demands. Sales of gas for private lighting fell off very seriously during the period of great depression in 1911, and continued to do so up to June, 1912, when an increase of output was again shown, and had gone on uninterruptedly month by month until the present time. The total increase in private lighting last year, while only some 314,000 cubic feet, was entirely due to the improvement in the second six months. In the matter of high-pressure gas lighting they were making considerable progress, due to the energy and ability shown by the Manager. He believed he was right in claiming that they had attained greater results in this direction than any other South American Gas Company, as they had also, he thought, in the number of gas-engines on the mains—and this notwithstanding the

keen competition of electricity. He mentioned these matters, not only for the information of the shareholders, but to show the local representatives that the efforts they were making to improve the business of the Company were fully appreciated. As to the prospects for the current year, they had received a cable from the Manager, who stated that the sales of gas for private lighting and heating purpose still continued to make steady progress, and there was every prospect of a large increase of profit in Bahia Blanca this year. He also reported that excellent progress was still being made with high-pressure gas lighting; and as they had about sufficient coal in the works to carry them on to the end of this year, and stores paid for, he believed the Manager's forecast was justified. As to finance, the Company had insufficient working capital, and owed their bankers about £40,000, which must be paid off before long. This the Board proposed to do by an offer of debentures to the shareholders. With a view of assisting the Company in every way possible, the Directors had decided from now onwards not to claim the full amount of their fees till the affairs of the Company were in a more flourishing condition. Also arrangements were being made whereby economies in London could be effected.

The report was adopted, the retiring Director (Mr. Ross Pinsent) and the Auditors (Messrs. A. Goddard and Co.) were re-elected, and the proceedings closed with a vote of thanks to the Chairman, Directors, and staffs in Bahia Blanca and London.

BIRMINGHAM GAS AND WATER ACCOUNTS.

We have received from Mr. Thomas H. Clare, the City Treasurer, a copy of the City of Birmingham financial "Blue-Book" for the year 1912-13. This is accompanied by an epitome, from which the following figures relating to the gas and water accounts have been taken.

As to the Gas Department, the revenue account shows a balance of income in excess of expenditure of £190,642 for 1912-13, carried to profit and loss account. After providing for annuities, interest, and redemption of debt, the balance of the profit and loss account was £77,725. The amount of capital expended during the year was £99,967; and the value of buildings and plant abandoned, &c., was £64,726. The total expenditure on capital account to March 31 was £2,451,524. The amount of the reserve fund provided out of revenue, with accumulations, was £100,000; while the gross total of loans negotiated, including annuities, was £2,908,949. The sum provided from revenue for redemption of debt during 1912-13 was £48,496; and the gross amount provided for redemption of debt to the end of the year was £1,077,532. The balance of loans remaining to be provided for was £1,831,417.

The revenue account of the Water Department for 1912-13 shows a balance of income in excess of expenditure of £217,866, carried to profit and loss account. The profit and loss account shows a loss of £75,909, which has been provided for as follows: Contribution from the borough rate, £65,000; transfer from capital under section 22 of the Birmingham Corporation Water Act, 1902, £943; balance carried forward, £9966. The amount of capital expended during the year under the 1892 Act was £10,823. The total expenditure on capital account to March 31 under the 1875 and 1879 Acts was £2,097,860; and under the Act of 1892, £6,254,996. The gross amount of loans negotiated, including annuities, under the 1875 and 1879 Acts, was £2,097,860; and under the 1892 Act, £6,272,500. The amount provided from revenue for redemption of debt during the year, under the 1875 and 1879 Acts, was £17,254; and under the 1892 Act, £9085. The gross amount provided for redemption of debt to the end of 1912-13, under the 1875 and 1879 Acts and the 1892 Act, was £324,059. The balance of loans to be provided for, under the 1875 and 1879 Acts, was £1,828,840; and under the 1892 Act, £6,217,461.

GAS-TESTING IN BIRMINGHAM.

Proposal to Adopt the "Metropolitan" Argand Burner.

In the report which the Gas Committee will present at the quarterly meeting of the Birmingham City Council to-day, they point out that the parliamentary regulations governing the department provide that the gas, at the works, must be of 15-candle power, tested by Sugg's No. 1 "London" argand burner. In the opinion of the Committee, however, the time has now arrived when application should be made to the Local Government Board to amend the Consolidation Act so as to allow the use of the No. 2 "Metropolitan" argand burner instead of the No. 1 burner, as they feel that the gas tested with the No. 1 burner is being tested under unfavourable conditions, and has to be enriched in order to increase its illuminating power, and so pass the No. 1 burner standard, whereas this would be unnecessary with the No. 2 burner, and the revenue of the department, and therefore of the ratepayers, would benefit by the cost of this enrichment.

The Committee said that they fully realize that the calorific value of the gas must be maintained, and are satisfied that their proposals will not interfere with the interests of the consumers. They therefore recommend that the Town Clerk be instructed to apply to the Local Government Board to amend the Local Act in order to give effect to the proposals.

Blackburn Lamplighters Demand Higher Wages.—The Gas Workers' and General Labourers' Union have sent an application to the Blackburn Corporation for an increase in wages. In the lamps department, an advance of ½d. per hour is asked for labourers, including those engaged in the two occupations of lamplighting and labouring; and an increase of 1s. per week to men described as lamplighters only—all men in the lamps department to be provided periodically with jackets and hats. It is also asked that overtime should be paid for at the rate of time-and-a-quarter for the first two hours, and time-and-a-half for all subsequent overtime each day. Extra time worked between noon on Saturday and starting-time on Monday morning is to be paid for as double time, and to include all recognized holidays.

MANUFACTURE OF GAS-RETORTS.

The writer of the article on the above subject in the Engineering Supplement to "The Times," reproduced in the "JOURNAL" last week with Mr. Bywater's reply to it, sent to our contemporary the following rejoinder, which appeared last Wednesday.

It is, perhaps, scarcely necessary for me to reply to the letter *re* the above subject. As the writer of the paragraph on retorts, I should, however, like to point out that no attempt is made by the Secretary of the Committee to refute my statement that not altogether satisfactory material has been turned out as a result of their recommendations. On the contrary, it is admitted that "unfortunately some of the retorts made to the specification . . . have not given entirely satisfactory results;" and it is, no doubt, retorts such as these—costing no inconsiderable amount as compared with the original article—which have engendered some amount of reasonable discontent among those engineers who were sufficiently hapless to be allotted them.

The burden of your correspondent's letter would merely appear to be the exaltation of his Committee at the expense of certain fire-clay manufacturers. It must be considered, however, whether this mistake would have occurred had the latter been allowed to continue their own practices unmolested from outside. The more serious aspect of the blunder is the expense which no small number of unsuspecting gas authorities have incurred by the dispersion of a certain quantity of what is acknowledged to be an undesirable substance.

The writer fully recognizes that select committees invariably consider themselves to be beyond the pale of criticism (particularly when the latter is adverse); and the one in question is no exception to the rule. The criticism in this case, however, has at least afforded the Refractory Secretary an opportunity of publicly transferring the responsibility from the shoulders of his Committee to those of an equally self-reliant and unfaltering body.

NOTTINGHAM GAS EMPLOYEES' FUTILE STRIKE.

Insensible to all considerations, except those which are regarded as favouring the perverse attitude persisted in by the men, the Executive of the National Amalgamation of Sheet Metal Workers have again, through their Secretary, intervened in relation to the strike of tinplate workers at the gas-meter repairing shops of the Nottingham Corporation. Disappointed by the failure of the general body of trade unionists in the service of the Council to render them the practical support they seemed to deem they had a right to expect, there is evidence that the members of the organization have already had more than sufficient of the trouble. It is doubtful, however, whether the latest communication sent a few days since to the Town Clerk by Mr. J. C. Gordon, the Secretary of the Amalgamation, is likely to open the door to a settlement; for upon the main point—that as to the retention in the shops of non-union labour—there is no indication of any acquiescence in the consistently logical view which the Corporation Gas Committee have throughout the controversy maintained. Mr. Gordon refers to what he describes as "harsh treatment" meted out to the employees—unmindful especially of the fact that it was this very procedure, attempted by the Amalgamation in regard to a single individual, which the Committee had themselves stepped in to prevent. In a sentence of his letter which savours of special pleading, Mr. Gordon avows that his Executive fails to understand why the Gas Committee "persistently refuse to adopt an impartial attitude, instead of rigidly adhering to the policy of upholding those who are responsible for the trouble." To all of which, by way of reply, it is only necessary to observe that for upwards of four months the Committee left the doors of the shop open, and indeed invited the disaffected hands to return—promising that any possible wounding of supposed trade union susceptibilities which might be occasioned by the retention of the non-union hand should be reduced to a minimum by so arranging that the subject of the official ostracism should be kept, as far as possible, apart to work by himself. But this idea did not comport with the drastic ultimatum which was launched with the approval of the National Executive; and if the members still find themselves relegated to a position of enforced inactivity, they have clearly only themselves to blame. Alternating with cajolery and threatening, Mr. Gordon in his communication (now made public) to the Town Clerk says: "We again ask that every aspect of the case in all its bearings should be reconsidered, as our Committee realize that the conditions prevailing at the Woodborough Road works for the past two years have been intolerable. The Spencer incident was the culminating point; and they are quite prepared to give their wholehearted support to the men as long as the same is necessary." It is difficult, however, to see what more in the nature of conciliatory arrangements the Committee can suggest.

The hollowness of the whole business was clearly to be inferred from the events of last Friday evening, when a meeting was held at the district office of the Gas Workers' Union to receive the reports from the Executives of the several societies representing members in the Corporation employ. It had been practically known all along what the upshot of the matter would be; but an attempt was made to impart an appearance of great momentousness to the occasion—Press representatives being kept in waiting for information as to the result of the private deliberations, as though almost the fate of the Municipality depended upon the outcome of the proceedings. All that was officially vouchsafed ultimately was that no decision had been arrived at, the matter having been postponed. A delegate was asked by one of the journalists if this meant "postponed indefinitely;" and the reply being in the affirmative, the only conclusion to be drawn was that the threatened general strike had quite fizzled out, as it had been anticipated would be the case by those who know how to value "bluffing" at its true worth.

The Gas Committee also held a meeting on Friday, at which Mr. Gordon's communication was brought under consideration; and although, as anticipated, no change resulted in regard to the situation from any action then taken, it was impossible that the allegations made

by him could be allowed to go uncontradicted. Acting under the Committee's direction, a reply has therefore since been sent by the Town Clerk (Mr. W. J. Board), in which he notes that the men's Committee agree that no useful purpose will be served by a further interview, unless the Committee are willing to give consideration to the request for Spencer's removal—a point as to which, it is observed, consideration has already been given upon several occasions, and the decision communicated. With regard to the suggestion that the Committee have persistently refused to adopt an impartial attitude in this matter, the Town Clerk adds that it is only necessary to refer to the correspondence and interviews which have taken place to show how entirely at fault Mr. Gordon's Committee are. The reference to the tinplate workers having been locked out is also described by the Town Clerk, as already indicated, as being entirely inaccurate; both the Gas Engineer and the Committee having, from the very commencement of the matter, invited the men to return to work. "The Committee," Mr. Board adds, "have not dealt out harsh treatment in any way; and their emphatic view is that the only harsh treatment that has been in any way shown in the matter has been by your Society. With regard to your reference to matters other than that relating to Spencer, the Committee have already dealt carefully with these, and have, as you know, taken steps to do away with any cause of complaint. The only question outstanding is that of Spencer; and upon that the decision of the Committee has been communicated to you on more than one occasion." Devoid of argument or practical support for their ill-advised action, the operatives have thus been placed in a parlous plight.

METROPOLITAN WATER BOARD.

Site for New Offices—The New Reservoirs.

At the Meeting of the Metropolitan Water Board last Friday—Mr. E. B. BARNARD in the chair—the question of a site for new central offices was again under consideration. The General Purposes Committee suggested two sites—one at Gray's Inn Gardens, immediately behind the Chancery Lane Station of the Central London Railway; and the other on the Board's own land at New River Head, Rosebery Avenue.

Mr. J. VESEY FITZGERALD, the Chairman of the Committee, moved that the Gray's Inn site should be chosen. He said it would cost £115,000 to build at Rosebery Avenue, which was out of the way, and only £90,600 to build on the other site. The cost of interest, &c., would, however, be £300 per annum more than at Rosebery Avenue; the cost of the site at Gray's Inn being £55,000. A third site in Belvedere Road, Westminster Bridge Road, opposite the new County Hall, was also mentioned, but not recommended.

Sir MELVILL BEACHCROFT thought that the Board should know more about the Belvedere Road site. If it came to a choice between Gray's Inn Gardens and Rosebery Avenue, he would vote for the latter. There would be advantages in the site at Belvedere Road for its proximity to the new County Hall. It would save the building of a hall to meet in, because the Council Chamber of the County Council would be available. It would also be convenient to have the municipal offices of London together. The site would cost, on an estimate of 30s. per foot super for 20,000 feet, £30,000, which showed a saving on the Gray's Inn Gardens site. The financial position of the Board was so unsatisfactory that it was essential to carry public opinion with the Board in any expenditure. He moved, as an amendment, that the question should be referred back to the Committee to consider the Belvedere Road site.

Mr. DOVE pointed out that the owners of the land and the buildings on the Belvedere Road site might, in view of the new County Hall, ask a great deal more for it than had been suggested. Then there were tenants' interests and leases to consider. By permission of the Chairman, he moved that the Board should build at Rosebery Avenue, in order that all the sites might be before members.

Mr. FITZROY DOLL said the building at Gray's Inn Gardens (Fulwood's Rents) would cost at least £125,000, and a yearly outgo of £8200 a year for thirty years. At Rosebery Avenue, which he denied was out of the way, they could build for £60,000, which would mean only £3000 a year.

Sir Melvill Beachcroft's amendment was lost; and by 29 votes to 16 the Board carried Mr. Dove's amendment agreeing to build on the Rosebery Avenue site.

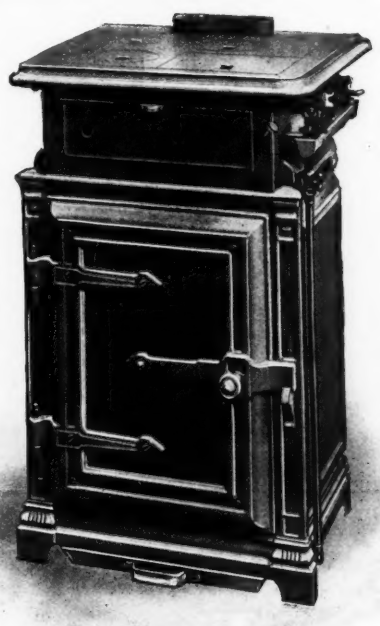
The Works and Stores Committee reported that they had decided to recommend the abandonment of the proposal to divide the two new reservoirs (Nos. 6 and 7) at Littleton, which the Board are to construct at a total cost of £1,650,200. The division of the reservoirs would cost £237,000.

Sir MELVILL BEACHCROFT remarked that the reservoir was gigantic, and would hold 7000 million gallons. The Director of Water Examination (Dr. Houston) had disclaimed responsibility for the quality of the water if the expenditure was abandoned.

Mr. MORITZ moved an amendment to the effect that the Chief Engineer (Mr. W. B. Bryan, M.Inst.C.E.) should satisfy the Board that the water in the reservoir would not be stored longer than that in the other reservoirs in the Thames Valley.

After further debate, however, it was decided to add words to the Committee's recommendation to the effect that the abandonment of the sedimentation tank must be without prejudice to any further report the Water Examination Committee might make before work had begun on No. 7 reservoir.

The Directors of the Newcastle-upon-Tyne and Gateshead Gas Company have declared an interim dividend upon the ordinary stock, for the half year ended June 30, at the rate of 4½ per cent. per annum, and an interim dividend at the rate of 4 per cent. per annum upon the preference stock.



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BIRMINGHAM WATER SUPPLY.

A Third Pipe-Line Required.

An important report will be presented at the meeting of the Birmingham City Council to-day with reference to the water consumption in the city and the necessity for increasing the supply from Wales. The report sets forth that the Committee desire to take the first opportunity of informing the Council that they are satisfied that an additional line of pipes on the Elan aqueduct will have to be laid at an early date, to convey an increased supply of water from Wales, and that, in addition, it may be necessary to enlarge the storage capacity of the reservoir at Frankley. As regards works, they think it will be unnecessary to obtain further parliamentary powers, but that it will be imperative to seek increased borrowing powers. Those available for water-works purposes extend to a sum of £182,554; and it is clearly necessary that before the provision of the third pipe can be undertaken further powers must be obtained. The Committee recommend the Council to apply to the Local Government Board for a Provisional Order altering or amending the Water Act of 1892, so as to permit the Board to sanction loans from time to time to carry out works of which the construction is already authorized by the Act. The Welsh water was first brought into distribution in October, 1905. The actual expenditure on the two-pipe scheme up to March 31, 1908, was £5,762,853; while the parliamentary estimate of the cost of the entire scheme was £5,851,000.

MANSFIELD WATER UNDERTAKING.

Need for Extensions.

With the rapid development which has been witnessed in recent years at Mansfield, Nottinghamshire's principal northern town, has necessarily come the requirement for the extension of many existing public undertakings, among which those controlled by the Corporation in relation to gas and water supply occupy the chief place. Some significant figures as to the growth of the borough were forthcoming on Wednesday last, when, by invitation of Alderman J. E. Alcock, the Chairman of the Water Committee, a visit of inspection was paid by members of the Corporation to the three pumping-stations, situate at Rainworth, Clipstone, and on the Chesterfield Road, and to the reservoir on Berry Hill. The occasion was utilized to direct attention to the necessity for the consideration at an early date of the question of providing a new reservoir, and of laying a new 12 or 15 inch main into the town for the purpose of ensuring a constant supply. At a gathering at Ollerton, following the tour of inspection, the Chairman referred to the fact that it was twenty-four years since the Improvement Commissioners purchased the water undertaking. At that period, the capacity of the works on the Nottingham Road was 200,000 gallons daily, supplying a population of 12,000. The old works were now discarded. The great contrast in relation to the figures which he had given as to the conditions prevailing twenty-four years ago, was shown by the fact that from the Rainworth and Clipstone wells the Corporation are now supplying a population of 60,000; the pumping capacity of the machinery being 1½ million gallons daily. The population has increased at a far greater pace than was anticipated when the wells were sunk; and as this increase seems destined to continue, Alderman Alcock recognizes that the capacity of the two wells will be so taxed that before long the Corporation will have to make further extensions. In addition to laying a new and larger main, the question will have to be considered of duplicating the machinery at the Chesterfield Road pumping-stating, from which a population of 8000 is at present supplied. Alderman Alcock congratulated the staff of the water undertaking upon the admirable manner in which the plant was maintained, and extended a hearty welcome to Mr. W. J. Rendell-Baker, the successor to the late Mr. Arthur Graham as Manager of the gas and water undertakings.

Gas-Workers' Conditions at Huddersfield.

The Huddersfield Gas Committee, in the minutes which they submitted at the last meeting of the Town Council, stated that, after carefully considering the wages paid and holidays allowed in certain other towns, they had resolved that the wages of the workmen engaged in the carbonizing department be increased by 2d. per shift; that the holidays remain as at present—namely, carbonizers and lamplighters seven days per annum, with pay, if engaged for a period of ten months in the year, and all other workmen in the service of the department four days per annum, with pay. An amendment to the adoption of the minutes was moved, to the effect that all the men should have seven days' holiday per annum; and in reference to this, Alderman Jessop (the Chairman of the Gas Committee) said the Committee had taken the trouble to ascertain what was best to be done for their men. The carbonizers and lamplighters formed 75 per cent. of the men, and the remainining 25 per cent. of bricklayers, labourers, and carpenters were members of trade unions, which regulated their holidays, wages, and hours of work. The Committee made inquiries from other gas-works in about twenty similar towns, with the following result: Blackburn, three days' holiday and 2s. less wages than at Huddersfield; Bolton, three days; Bradford, seven days; Halifax, the same as Huddersfield; Leeds, four days; Leicester, six days; Manchester, seven days; Middlesbrough, seven days; Nottingham, nine days; Oldham, two days; Darlington, seven days; Rochdale, none; Warrington, seven days. The reason why they had given seven days to the carbonizers was that their laborious work had been proved to the Committee; and the Committee thought they deserved the holidays. He contended that if they put the labourers on the same footing they would have to still further increase the wages and holidays of the carbonizers. The amendment was carried.

FACTS ABOUT GAS FIRES

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.—At the meeting of the Water Trust, the income was stated as £178,224. The expenditure amounted to £183,207, which includes the sum of £40,801 contributed to the sinking fund, out of which an amount of £37,939 of capital expenditure was paid off. The capital expenditure during the year, for pipes, new filters, &c., was £17,095. As the estimated expenditure is likely to exceed the income, the charge for water received through meters is to be raised by 1d.—from 6d. to 7d., but the ordinary rate of 10d. in the pound is be retained. By this means it is expected that the debit balance will be wiped out during the year, as the increased revenue is likely to benefit to the extent of £3000.

The surplus on the electric lighting account, amounting to £2169, is to be used for the purpose of reducing the capital, and not for the reduction of the rates, as was desired by the minority.

Alloa.—The gas sold during the past year amounted to 139,464,000 cubic feet—an increase of about 11½ million cubic feet over the corresponding period last year. The net profit, after deducting charges for interest, taxes, &c., is £2297.

Ardrossan.—Bailie Fawcett, the Convener of the Gas Committee, has reported upon the undertaking for the past year. The leakage has been reduced to 7½ per cent.—the lowest ever known in the town. This means a saving of 1,114,000 cubic feet. During the year nearly 300 cooking and heating appliances were installed; so that there are now nearly a thousand cookers fixed since the free issue was decided upon about three years ago. Thirty new consumers have been connected up, and an increased consumption, of a cash value of £1640, has resulted. This compares favourably with an expenditure of £1521 on cooking and heating appliances. The credit balance now amounts to £878. Some discussion ensued as to the publication of the monthly reports, which contained the candle power of the gas. It was stated that since these were stopped there had been many less complaints.

Berwick-on-Tweed.—The Gas Company have had a prosperous year, and a net profit of £1205 has resulted. Mr. Lee, the Chairman, mentioned that there had been a considerable increase in the gas sold compared with last year, and suggested that the usual dividend of 10 per cent. should be paid. This was agreed to.

Brechin.—Mr. Guthrie, the Chairman of the Gas Company, presided at the annual meeting, and proposed that a dividend of 18s. per share should be paid; and it was agreed to. Despite the rise in the price of coals, the Directors do not propose to raise the price of gas.

Cardenden.—A dividend of 6 per cent. for the year has been declared by the Gas Company, and the price of gas reduced by 2½d. per 1000 cubic feet.

Dunkeld.—The Gas Company have declared a dividend of 5 per cent., and have reduced the price of gas by 5d. per 1000 cubic feet.

Girvan.—Mr. W. Shankland presided at the annual meeting of the Gas Company, and congratulated the Manager (Mr. Thomas Watson) upon the results of the year's working. This congratulation took the more tangible form of a present of £10. The increased consumption is about 1¼ million cubic feet; and the dividend declared is 7 per cent. for the year, free of income-tax.

Grangemouth.—The Corporation have decided to reduce the price of gas to ordinary consumers by 1d. per 1000 cubic feet and by 2d. in the case of prepayment consumers. The prices are now respectively 2s. 10d. and 3s. 4d. per 1000 cubic feet. No rent is in future to be charged for either meters or cookers.

Hawick.—The annual meeting of the Gas Company was presided over by Provost Melrose, when the report of the Manager (Mr. J. D. Keillor) showed that 82 million cubic feet of gas had been sold—an advance of about 9 millions over last year. Gas sales had resulted in an increase of £10,696; while residuals had brought in £4500. The Chairman attributed the increase to the improvements made in the plant. The price of gas is to remain at the present figure of 2s. 3½d. per 1000 cubic feet, which is the lowest in the district.

Kirkcaldy.—The District Committee have received a report from Messrs. Leslie and Reid upon the proposed water-works. The offer of Messrs. Jackson and Anderson, of Edinburgh, for the reservoirs and piping, amounting to £61,727, and that of Messrs. Robert M'Laren and Co., of Glasgow, for pipes, for £8187, have been accepted.

Macduff.—The Directors have recommended a dividend of 5 per cent., and the reduction of the price of gas by 5d. per 1000 cubic feet. This was agreed upon at the annual meeting. Considerable alterations have been carried out at these works.

Montrose.—Mr. Muirden presided at the annnal meeting of the Gas Company, when a dividend of £2 12s. 6d. per share was decided upon. The price of gas is to remain as before. The report of the Manager (Mr. James Mitchell) showed that there had been an increase in the gas consumption and in the number of appliances fixed in the year.

Paisley.—The sum of £3800 is to be taken from the gas profits to relieve the rates; and these will be reduced by the amount of 1·62d. in the pound. The total profit from the Gas Department, including the amount brought forward from last year, is £7575; while £2587 has been put to the depreciation fund account. Renewals and extensions at the works cost £3554. Coal and other commodities are to cost over £6000 more during the coming year. The price of gas is to remain unchanged; but the estimates show that the profits will diminish to almost the vanishing-point. It was in these circumstances that the amount used for the reduction of the rates was kept down, so that £3625 could be carried forward.

Vale of Leven.—The Gas Company had their annual meeting on the 15th inst., when a dividend of 6 per cent. on the year's working was declared, and it was decided to reduce the price of gas to ordinary consumers from 3s. 3d. to 3s. per 1000 cubic feet—a reduction of 3d.

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The GILLED CIRCULATOR renowned for compactness and accessibility, with a four years' successful record behind it.

GEYSERS with patented internal construction, entirely obviating the use of soldered joints.

The DAVIS Gas Stove Co. Ltd. London

59, Queen Victoria Street, E.C.

'Phone: 636 City. Telegrams: "Degasco Cent London."

Since Mr. John Lang, the Manager of the Company, took up his duties some five years ago, the price of gas to ordinary consumers has been reduced by 9d. per 1000 cubic feet. It was further decided to lower the price of gas for cookers and engines from 2s. 9d. to 2s. 7d. The past year was the most successful in the history of the Company; and, owing to the increased demand for gas in the district, a number of extensions to the works have been agreed upon. The Manager was congratulated on the satisfactory state of affairs.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 26.

Sulphate of Ammonia.

Throughout the week there has been little animation in the market for this article. On the one hand, buyers have not shown much keenness to make further purchases; while, on the other hand, there has been no pressure on the part of sellers to dispose of their goods. Consequently quotations remain unchanged at £12 16s. 3d. per ton f.o.b. Hull, £12 17s. 6d. per ton f.o.b. Liverpool, and £12 18s. 9d. per ton f.o.b. Leith. In the forward position, the tone is also dull, and few transactions have been reported; but it has transpired that first-hand business has been done at £13 5s. per ton f.o.b. best ports for October-March delivery.

Nitrate of Soda.

There has been a better feeling in this market, and spot values have advanced to 10s. 6d. per cwt. for ordinary, and 10s. 9d. for refined quality.

LONDON, *July* 28.

Tar Products.

The markets for tar products are still very quiet, and little business has been reported during the past week. Pitch is without alteration. Consumers are still unwilling to do business, even at to-day's prices. Several orders have been taken for shipment to the Continent at very low figures for prompt delivery. There appears to be a struggle going on between pitch makers and consumers. The makers in this country refuse to sell at to-day's prompt prices; while, on the other hand, consumers will not pay more, and appear to prefer to wait the course of events unless they can get on at to-day's values. Benzols are fairly steady, although for the forward position some business appears to be done at slightly lower values. Solvent and heavy naphthas are quiet. Creosote remains fairly steady, although some of the country makes are offering at slightly lower prices. There has been a decided improvement in crude carbolic; 1s. 5d. having been freely paid for the 60's quality.

The average values during the week were: Tar, 25s. 3d. to 29s. 3d. Pitch, London, 41s. to 42s.; east coast, 40s. 6d. to 41s. 6d.; west coast, prices nominal, Manchester, 40s. to 43s.; Liverpool, 41s. to 43s.; Clyde, 41s. to 42s. Benzol, 90 per cent., naked, London, 1s. 0½d. to 1s. 1d.; North, 1s. to 1s. 0½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 11d. to 11½d.; North, 11d. to 11½d. Crude naphtha, in bulk, London, 5½d. to 5¾d.: North, 4¾d. to 5¼d. Solvent naphtha, naked, London, 11d. to 11½d.; North, 9d. to 9½d. f.o.b. Heavy naphtha, naked, London, 11d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3½d. to 3¾d.; North, 2⅞d. to 3d. Heavy oils, in bulk, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 5d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There is very little fresh to report concerning this article. The market still remains extremely quiet, and the efforts to make a demand have been without success. To-day outside London makes are still quoted at £12 5s.; Hull, £12 16s. 3d.; Liverpool, £12 17s. 6d.; Leith, £12 18s 9d.; Middlesbrough, £12 16s. 3d. A premium of 2s. 6d. to 3s. 9d. per ton is asked for the forward position.

A correspondent, largely interested in tar and ammonia, writes: Such pessimistic statements are made just now in some trade papers that a little real information may be of interest to makers. Pitch, for instance, is very much lower on paper than it is in reality. London is stated to be 41s. or 42s., but this is entirely incorrect, and no London maker would to-day accept less than 48s. Then look at sulphate of ammonia. First-class London makes are bid for at £12 11s. 3d. and £12 12s. 6d. net and naked; and yet Hull and Liverpool are stated to be round about £12 17s. 6d., less 3½ per cent., bags free. The position is ridiculous and obvious.

Stoke-upon-Trent Gas Department.—According to the statement of accounts of the Gas Department of the county borough of Stoke-upon-Trent for the year ended 31st of March last, a copy of which we have received from Mr. W. Langford, of Longton, the net profit realized by the four constituent authorities was: Burslem, £1970; Stoke, £729; Fenton, £579; Longton, £1320—being respectively 2·21d., 1·24d., 1·33d., and 1·84d. per 1000 cubic feet of gas sold. The number of cubic feet of gas sold per ton of coal carbonized was: Burslem, 11,271; Stoke, 11,836; Fenton, 11,315; Longton, 12,090. The accounts will be noticed more fully next week.

Irish Gas Manager's Bereavement.—We regret to learn that Mr. H. W. Saville, Manager of the Drogheda Gas-Works, sustained a distressing bereavement last Friday by the drowning of his two young children, Dora and Hilda, in the River Boyne. The little ones were playing on the river bank, when their doll's perambulator fell into the water. They tried to re-capture it, but unfortunately stumbled in. An aunt who was in charge of the children jumped into the river to save them; but was soon in difficulties herself. A young man who heard the cries for help pluckily succeeded in rescuing the aunt and the children; but the latter were found to be beyond human aid.

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MANCHESTER."

Telephones:
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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is rather brisker, and prices are steady for cargoes for early delivery; there being fuller exports. In steam coals, about 15s. 3d. per ton f.o.b. is quoted for prompt shipment, with 15s. for delivery in the latter part of August, for best Northumbrians. Second-class steams are steady at from 13s. 3d. per ton f.o.b. For steam smalls there is a rather brisker demand—the price varying from 8s. 3d. to 9s. 9d. per ton, according to quality. The gas coal trade shows now an improving consumption, though the increase is not very rapid as yet. In prices, best Durhams are quoted from 14s. 10½d. to 15s. per ton f.o.b.; second-class gas coals are near 13s. 9d., and are in full request; while for "Wear specials" the price is firmer at from 15s. 3d. to 15s. 6d. per ton f.o.b. A sale of 80,000 tons of second-class gas coals is reported, over next year, at a price believed to be about 19s. 4d. per ton delivered, which shows an easier market for Genoa. There appears to be some disposition on the part of merchants to offer gas coal for next year at lower prices than those that now rule, as shown by the sale above, as well as by contracts, such as that for Christiania, named a week ago. At the same time some of the producing collieries have made heavy contracts, and are thus less inclined to grant such concessions. Coke is rather weaker. The output of gas coke increases, though the shipments are good; and the price is from 16s. 6d. to 17s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

On account of the miners being on holiday in the West of Scotland and in Fife, and the stoppage of the pits in the Lothians by reason of the Leith and Granton strikes, there was no business transacted on the Glasgow Coal Exchange.

Beverley Gas and Water Supply.

We have received from the Gas and Water Engineer of the Beverley Corporation (Mr. F. W. Oldfield) a copy of his report for the year ended the 31st of March. It furnishes the following particulars: The quantity of gas sold was 74,629,746 cubic feet—being an increase of 1,398,356 cubic feet, or 1·9 per cent., compared with the preceding year, and equal to 10,699 cubic feet per ton of coal carbonized, against 10,466 cubic feet before. The make of gas was 79,867,500 cubic feet, or 11,450 cubic feet per ton. There were 6915 tons of coal and 60 tons of cannel used in the year. The quantity of coke available for sale was 3343 tons, or 9·58 cwt. per ton of coal; tar sold, 454 tons, or 13 gallons per ton; ammoniacal liquor produced, 741 tons, or 25·3 lbs. of sulphate per ton. The gross profit was £4643; the net profit, £2873; and the amount handed over in reduction of the rates, £1634. The quantity of water pumped from the well was 122,211,000 gallons. The gross profit for the year was £1759, and the net profit £773, compared with £1827 and £831 in the preceding twelve months.

Gas Collector Bitten by a Dog.—At the Lambeth County Court last Wednesday, John Williams, a prepayment meter collector in the service of the South Metropolitan Gas Company, sued Mr. John Baines, of Branksome Road, Brixton, for compensation for injuries sustained through being bitten in the leg by a dog owned by him. Plaintiff called at the defendant's house to collect the money from the prepayment meter, and was attacked by the dog, which, it was stated in evidence, "had a nasty temper." He suffered considerable pain, and claimed £20 damages. His Honour Judge Parry allowed him £5, with costs.

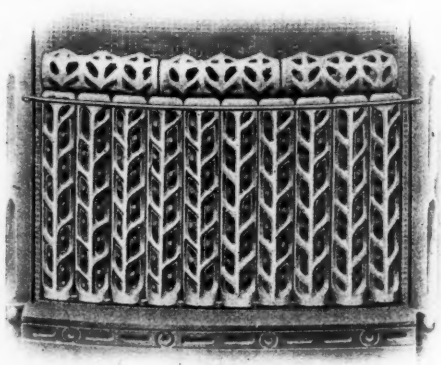
Aldershot Gas, Water, and District Lighting Company.—The Directors report for the half year ended June 30 that the total revenue was £36,444 and the expenditure £26,534; leaving a surplus of £9910. After providing for dividends on consolidated preference stock and interest on mortgage and debentures, they recommend dividends for the half year at the rate of 6·2 per cent. per annum on the "A" stock, 4·7 per cent. per annum on the "B" stock (these rates being in accordance with the sliding-scale), and 5 per cent. per annum on the "C" consolidated stock, all less income-tax. Exclusive of works and War Department supplies, the sale of gas had increased by 6 per cent. in the half year.

Carnetown (Abercynon) Water Supply.—In the House of Commons, on Monday last week, Mr. Keir Hardie asked the President of the Local Government Board whether his attention had been called to the shortage in the water supply at Carnetown, Abercynon, in consequence of which the drains remain unflushed and the cottagers were without water in their homes; whether he was aware that the water supply was drawn from a private reservoir which was inadequate and not properly protected from pollution; and whether he would cause an investigation to be made in the interests of the public health. Mr. Burns, in reply, said he was in communication with the Local Authority on the subject.

Londonderry Water Supply.—A report recently presented to the Londonderry Corporation deals with the present and future water supply of the city. It is pointed out that the estimated population of the city is 41,000, and that the available continuous yield from present catchment areas is 1½ million gallons per day, capable of supplying about 37 gallons per head. The average consumption last year was 41¼ gallons per head per day; and from past experience the citizens could not be provided for with less than 40 gallons. Thus, it is submitted, the supply is now short of actual needs by 3 gallons per head, or equal to 123,000 gallons per day, and no provision can be made from the existing works to meet the shortage. The question then arose how the city would stand in the event of any increase of population (and an increase of 7000 is anticipated in view of local shipyard enterprise) or any shortage in the rainfall. An acute crisis might, it was believed, happen in any year, and "a disaster, affecting the health and commercial prosperity of the city for generations to come" might result. Serious and urgent attention is therefore claimed for the whole question.

The Patent "THERMO-X" FIREFRONT.

The invention that brought in the Modern Gas Fire:



The THERMO-X Firefront.

The RADIANT (Thermo-X)

that is being adopted by so many important gas undertakings as their one standard for all Gas Fires:

The THERMO-X Radiant.

JOHN WRIGHT & CO., Essex Works, BIRMINGHAM.

Tottenham and Edmonton Gas Company.—At the annual general meeting of this Company next Saturday, the Directors will report that the accounts for the six months ended the 30th of June showed that, after providing for interest charges and carrying £2000 to the renewal fund, there remains a profit balance of £18,664. The amount brought forward being £44,247, the total standing to the credit of the net revenue account is £62,911. The Directors recommend payment of the full statutory dividends of 7⅜ per cent. per annum on the "A" stock and 5⅞ per cent. per annum on the "B" stock. This will absorb £18,383, and leave £44,528 to be carried forward. The increased dividends are due to the reduction in the price of gas from the 1st of January last. The consumers now number 64,032; and there are in use in the district 37,059 cooking and heating stoves. The Company's Bill for the amalgamation of the Enfield Gas Company and for power to supply electricity in the Wood Green district has passed through all its stages in both Houses of Parliament, and now awaits the Royal Assent. In March last, £60,000 of the Company's "B" stock was offered for sale by tender, and realized an average price of £116 10s. 9d. Reference is made to the recent death of Mr. James Cloudsley. As a Director of the Enfield Company will join the Board next January, the vacancy just caused will not be filled up. The sales of gas show an increase of 8·29 per cent. compared with the first half of last year.

As a recognition of bravery displayed last May in rescuing two little girls from drowning in the River Lea, Albert Fleet, a clerk, aged 16, has been presented, at the works of Messrs. Thomas Glover and Co., of Edmonton, where he is employed, with the Royal Humane Society's medal. A purse of money was also at the same time handed to Fleet by the firm.

At an inquest at Stockport, on the body of a three year old child, the mother said she left the little girl, with another daughter four years old, in the house while she went shopping. There was no fire in the grate, but there was "just a glimmer of a light" on a gas-ring. The gas man, she added, said the ring had to be placed on the floor. After ten minutes' absence, she was sent for, and on her return found the deceased had been badly burnt—the elder girl stating that the accident happened through her sister standing over the ring to turn out the light. The Deputy-Coroner (Mr. J. A. K. Ferns) said the mother had been thoughtless, if not actually careless, in leaving the children in the room alone where there was a lighted gas-ring on the floor. The Children Act, 1908, seemed to be defective on this particular point. The Act stated that a child under the age of seven years must not be in a room containing an open fire-grate not sufficiently protected. A lighted gas-ring or stove could not be held to be an open fire-grate, though it might be an open fire. It was perhaps more dangerous than the fire. It was also dangerous to place gas rings on the floor. A verdict of "Accidental death" was returned, the Jury adding a rider that they were of opinion that the Corporation ought to instruct their men to put the gas-rings out of danger.

Stock of the Gosport Gas Company, amounting to £350, recently changed hands at a public open competition at the rate of from £120 to £122 10s. per £100.

With reference to the paragraph on p. 264 of last week's issue of the "JOURNAL," regarding the high-pressure gas-main which is being laid from Leatherhead to Cobham, it may be mentioned that "Mannesmann" weldless steel spigot and faucet tubes with rigid joints are being used.

The annual sports of the employees of the Plymouth and Stonehouse Gas Company were held last Saturday. Valuable prizes were offered by the Directors, and a number of interesting events were keenly contested. The weather was beautiful, and there was a numerous gathering of spectators. There were races for employees of different ages and for the sons and daughters of employees; also two in which the workpeople of local firms were allowed to compete. At the close of the programme, Sir Joseph A. Bellamy, the Chairman of the Company, presented the prizes to the winners. The arrangements were admirably carried out by a Committee, of which Mr. P. S. Hoyte (the Engineer) was Chairman and Mr. F. Phillips the Hon. Secretary.

A contract has just been secured by the Canadian representative of Messrs. Ed. Bennis and Co., Limited, of Little Hulton, Bolton, for the supply of three "Bennis" chain grate stokers for the Toronto Water-Works. These "Bennis" long-life links are, it is pointed out, taking the place of links of other makes to such an extent that no less than forty chain grates at the Neasden power station of the Metropolitan Railway have been relinked with them, while they have also been substituted for other links at the Manchester Corporation electricity works. The question of efficient steam raising is, of course, of importance also in gas-works; and in this connection we learn that a gas-works in the Midlands has placed a second repeat order for two "Bennis" stokers and self-cleaning compressed air furnaces for machine-firing the boilers.

APPLICATIONS FOR LETTERS PATENT.

16,260.—PARKINSON AND W. & B. COWAN, LIMITED, and CHESHIRE, W., "Prepayment mechanism." July 15.
16,318.—KOPPERS, H., "Ovens for generating gas and producing coke. July 15.
16,370.—EMPIS, H. C., "Converting hydrocarbons into gas." July 16.
16,388.—CARPENTER, C. C., "Igniting gas-burners." July 16.
16,410.—BULLOCK, G. F., "Air-gas plant." July 17.
16,485.—LACASSE, V., "Electric and gas radiator." July 17.
16,571.—WILSON, W. A., "Fuel for gas-fires." July 19.
16,612.—MOELLER, J. and WOLTERECK, H. C., "Distillation of bituminous material." July 19.

PARKINSON WATER HEATERS

The

"TOTTENHAM" BATH HEATER.

Provides Hot Baths with minimum outlay.

Requires no special gas service—water from main or tank.

Always full of water.

When water is sufficiently heated, turn on the cold water and the hot water is driven from the outlet, being replaced by cold water ready for next use.

Full Particulars on Application.

SPECIALLY SUITABLE FOR HIRING PURPOSES.

THE PARKINSON STOVE CO., LTD.
(Incorporating Maughan's Patent Geyser Co.),
BIRMINGHAM and LONDON.

GAS COMPANIES' STOCK AND SHARE LIST.

On the Stock Exchange last week, the prevailing tendency—for it varied fitfully, blowing first from one quarter and then from another—was rather towards dulness and an indisposition to commit oneself much either way. Markets waited patiently, hoping from day to day for some sign of a solution to the interminable Balkan tangle and finding none; and the labour storm-cloud in the Transvaal is still brooding overhead. Then the Railway Market received a nasty jar when the first dividend announcement of the half year came out. Happily later ones told a different tale. All through, however, was on a quiet holiday scale. The opening was rather gloomy and apprehensive, and prices in most lines were weaker. But a recovery set in later, and the close was fairly steady. Consols were unmoved, Rails rather uneven, and American firm. Tuesday opened more bright and hopeful, and prices rose in response to buyers. Consols gained $\frac{1}{8}$ for the account, American continued to rise, and Foreign were quite strong; but Rails could not participate. The tone was less cheerful on Wednesday, and markets weakened. Consols held tight; but Rails were depressed and American less firm. Thursday was very quiet and generally dull. Gilt-edged were quite stagnant, Rails had a further fall, but closed above the worst, and American see-sawed. Friday was depressed by Balkan affairs, and Government issues were weaker; but Rails were exhilarated by the latest dividend announcements. American were stronger. Saturday was a very quiet day, and movements were slight and unimportant—markets scarcely affording any perceptible sign. Consols closed steady at $72\frac{5}{8}$ to $73\frac{1}{8}$—being a rise of $\frac{1}{8}$ in the week. In the Money Market, the tendency was variable; but under the stimulus of a fair demand it closed firm. Business in the Gas Market was quite up to the holiday average in point of volume, and so steady was the tone that not a single variation was made throughout the entire list of issues quoted on the London Stock Exchange—an incident believed to be without precedent. The accounts of important undertakings now to hand continue to show good sales both of gas and of residuals in the first half of 1913; and the state of the industry would be entirely satisfactory but for the countervailing burden of prices paid for coal and oil. In Gaslight and Coke issues, the ordinary was active and firm at the close figures of $102\frac{5}{8}$ to $103\frac{1}{2}$—only one small lot going specially at $102\frac{1}{4}$. In the secured issues, the maximum changed hands at 75 and $77\frac{1}{2}$, the preference at $96\frac{3}{4}$ to 98 (with a special odd deal at $94\frac{3}{4}$), and the debenture at $72\frac{1}{2}$ to $73\frac{1}{2}$. South Metropolitan was quiet at $110\frac{1}{2}$ to $111\frac{1}{2}$; and the debenture fetched $71\frac{1}{2}$ to 73. In Commercials, there were dealings in the 4 per cent. at $106\frac{1}{2}$ and 107; in the $3\frac{1}{2}$ per cent., at $102\frac{1}{2}$ and $103\frac{1}{2}$; and in the debenture, at 70 and $70\frac{1}{2}$. Among the Suburban and Provincial group, British marked $45\frac{1}{4}$, Brentford new 200, Ilford "B" $120\frac{3}{4}$ and $121\frac{1}{2}$, and South Suburban $117\frac{7}{8}$ to $118\frac{1}{2}$. In the Continental Companies, Imperial realized $162\frac{1}{2}$ to $165\frac{1}{2}$, Union 80, and European $17\frac{7}{8}$ to $18\frac{3}{8}$. Among the undertakings of the remoter world, Bombay was done at $6\frac{1}{2}$ and $6\frac{3}{8}$, Primitiva at 6 to $6\frac{3}{16}$, and ditto preference at 5 to $5\frac{1}{8}$.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 11	5	Alliance & Dublin Ord.	66½—68½	..	7 6 0
374,000	,,	July 11	4	Do. 4 p.c. Deb.	80—83*	..	4 16 5
280,000	5	April 11	7½	Bombay, Ltd.	6¾—6¾	..	5 11 1
50,000	10	Feb. 27	15	Bourne- 10 p.c.	28½—29½	..	5 1 8
832,000	10	,,	7	mouth Gas B 7 p.c.	15½—16	..	4 7 6
75,000	10	,,	6	and Water Pref. 6 p.c.	13½—14½	..	4 4 3
380,000	Stk.	Feb. 27	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New	200—205	..	5 7 4
50,300	,,	,,	5	Do. 5 p.c. Pref.	113—115	..	4 6 11
206,250	,,	June 13	4	Do. 4 p.c. Deb.	92—94	.	4 5 1
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.	206—211	.	5 4 3
244,200	,,	,,	8	Do. A Ord. Stk.	151—154	..	5 3 11
630,000	20	Mar. 28	12½	British	45—46	..	5 8 8
120,000	Stk.	June 27	4	Do. 4 p.c. Deb. Stk.	87—89	..	4 9 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	83½—91½	..	4 7 5
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,900	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	75—80	..	5 12 6
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	139½—111½	..	4 9 8
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.	105—107	..	5 2 1
660,000	,,	,,	5¼	Do. 3½ p.c. do.	102—104	..	5 2 6
175,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	69—71	..	4 4 6
800,000	Stk.	,,	4	Continental Union, Ltd.	80—83	..	4 16 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	124—126	..	5 11 1
492,270	Stk.	—	5¾	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,140	10	Jan. 16	10	European, Ltd.	17½—18½	..	5 8 1
16,386,660	Stk.	Feb. 13	4/17/4	Gas- 4 p.c. Ord.	102—104	..	4 13 7
2,600,000	,,	,,	3½	light 3½ p.c. max.	75—78	..	4 9 9
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	95—98	..	4 1 8
4,674,850	,,	June 13	3	Coke 3 p.c. Con. Deb.	71½—73½	..	4 1 8
958,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.	89—91	..	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	April 25	11	Hongkong & China, Ltd.	17—17½	..	6 5 9
131,000	Stk.	Mar. 13	7½	Ilford A and C	152—155	..	4 18 4
65,780	,,	,,	6½	Do. B	120—122	..	5 0 5
65,500	,,	June 27	4	Do. 4 p.c. Deb.	87—89	..	4 9 11
4,940,060	Stk.	May 16	9	Imperial Continental	162—167	..	5 7 9
1,235,000	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	85—87	..	4 0 6
900,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.	120—123	..	4 17 7
561,000	Stk.	Feb. 27	10	Liverpool United A	208½—210½	..	4 15 0
718,100	,,	,,	7	Do. B	147½—149½	−1½	4 13 8
306,083	,,	June 27	4	Do. Deb. Stk.	96—98	..	4 1 8
63,480	Stk.	June 27	3	Maidstone 3 p.c. Deb.	66½—68½	..	4 7 7

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 13	6	Malta & Mediterranean	4⅝—4¾	..	6 3 1
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	98—100	..	4 10 0
541,920	20	May 30	4	Monte Video, Ltd.	12½—13	..	6 3 1
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.	99—99½	+¼	4 10 6
529,705	Stk.	June 27	3½	Do. 3½ p.c. Deb.	83½—84½	..	4 2 10
55,940	10	Feb. 27	7/7/0	North Middlesex 7 p.c.	13—14	..	5 4 7
300,000	Stk.	May 16	8	Oriental, Ltd.	124—129	..	6 4 0
60,000	5	Mar. 28	10	Ottoman, Ltd.	8¼—8⅜	..	5 14 3
60,000	50	Feb. 27	13	Portsea, Island B	125—128	..	5 1 7
100,000	50	,,	12	Do. C	122—125	..	4 16 0
249,980	5	May 16	8	Primitiva Ord.	6⅜—6½	..	6 8 0
499,960	5	June 27	5	,, 5 p.c. Pref.	4⅞—5⅛	..	4 17 7
521,600	100	June 2	4	,, 4 p.c. Deb.	93—95	..	4 4 3
346,198	Stk.	June 27	4	River Plate 4 p.c. Deb.	90—92	..	4 7 0
275,000	5	Apl. 11	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	11½—11⅝	..	5 2 2
125,000	50	July 1	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Mar. 13	10	Sheffield A	225—227	..	4 8 1
209,984	,,	,,	10	Do. B	225—227	..	4 8 1
523,500	,,	,,	10	Do. C	224—226	..	4 8 6
90,000	10	May 30	7½	South African	9½—10½	..	7 2 10
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.	109½—111½	..	4 18 0
1,895,445	,,	July 11	3	Do. 3 p.c. Deb.	71½—73½*	..	4 1 8
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.	161—164	..	5 4 4
952,795	Stk.	Feb. 27	6	S'th Suburb'n Ord. 5 p.c.	117—119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	115—117	..	4 5 6
117,058	,,	June 27	5	Do. 5 p.c. Deb. Stk.	115—117	..	4 5 6
594,740	Stk.	May 16	5	Southampton Ord.	102—105	..	4 15 3
120,000	Stk.	Feb. 13	7¾†	Tottenham A 5 p.c.	139—142	..	5 3 10
543,940	,,	,,	5⅝†	and B 3½ p.c.	115—117	..	5 0 5
149,470	,,	June 27	4	Edmonton 4 p.c. Deb.	90—92	..	4 7 0
182,380	10	,,	5	Tuscan, Ltd.	5—6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	94—96	..	5 4 2
236,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.	114—115	..	4 6 11
				Wandsworth, Wimbledon, and Epsom—			
30,000	Stk.	..	..	Wandsworth A 5 p.c.	160—165	..	—
255,636	,,	..	..	,, B 3½ p.c.	132—137	..	—
108,075	,,	..	..	,, C 3½ p.c.	113—118	..	—
352,000	,,	..	..	Wimbledon 5 p.c.	110—115	..	—
98 000	,,	..	..	Epsom 5 p.c.	117—122	..	—
88,416	,,	June 27	3	3 p.c. Deb. Stk.	68—70	..	4 5 9

Prices marked * are "Ex-Div." † Next Dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER AND MANAGER. Abercarn Urban District Council. Applications by Aug. 12.
CHEMIST OR CHEMICAL ENGINEER. Messrs. Simon-Carvès, 20, Mount Street, Manchester.
WORKING MANAGER. Haverhill Gas Department. Applications by Aug. 5.
FOREMAN (GAS-WORKS). Applications by Aug. 9. No. 5768.
DISTRICT INSPECTOR OF COOKING AND HEATING APPARATUS (Shanghai). Applications to Mr. J. W. Mackay, 14, Redston Road, Hornsey.
REPRESENTATIVES (MANTLES). Dr. G. P. Drossbach and Co., Freiberg, Saxony.
REPRESENTATIVE (LAMPS). No. 5769.
TRAVELLER. Lowen, Hartridge, and Co., 36, Aldersgate Street, E.C.
CANVASSER AND ADVISER. No. 5776.
GASFITTER. Southborough Gas-Works.
MAN FOR AMMONIA PLANT. Box 288, care of Robertson Scott, Edinburgh.
STOKER. Fenny Stratford Gas-Works.

Appointments, &c., Wanted.

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CHEMICAL PLUMBER. Davies, Galloway Road, Shepherd's Bush, W.
REPRESENTATIVE OF FIRM, &c. (Vancouver, B.C.). No. 5771.
MANAGER (Home or Abroad). No. 5772.

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TENDERS FOR

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STRATFORD-ON-AVON GAS DEPARTMENT. Tenders by Aug. 9.

Cookers and Heaters, &c.

BELFAST GAS DEPARTMENT. Tenders by Aug. 7.

General Stores (Tinned Ware, Sulphuric Acid, &c.).

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 19.

Oxide.

SALFORD GAS DEPARTMENT.

Pipes, &c.

HEYWOOD GAS DEPARTMENT. Tenders by Aug. 19.

Tar.

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